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THE FOUNDRY

EDITORIAL

Dislocations in Industry Follow Priorities

AN UNDERTAKING of the magnitude provided by the combination of our own national defense effort and the aid to Britain program cannot help but result in many serious dislocations of both the industrial and civilian economy of this country. Already the foundry industry is feeling the pinch of the approaching wartime basis, due to priorities on magnesium, aluminum and nickel, and the tightness of other materials. In all probability this represents only the beginning and as the pressure of production and procurement increases, control in other lines may follow. While the volume of defense orders declined somewhat during the past few months, this does not mean that the peak of industrial production has been reached. Estimates vary widely, some authorities believing the new British aid program, as provided by the recently enacted lend-lease bill, coupled with the remaining purchases to be made on the previous appropriation, will add at least 50 per cent to the present demand on the productive capacity for war materiel.

What will be the effect of present trends upon the various branches of the foundry industry? Although some plants are handicapped by serious shortages of basic materials and, therefore, must curtail output of certain types of castings, it seems entirely probable that the total production of castings in the United Sates will increase for some time to come. The constantly growing demand for castings to be used in the many ramifications of defense work appears likely to be augmented by a considerable expansion of consumer purchasing. Incidentally, the work of convincing military experts of the availability of cast products for many armament uses, including cast shells, is beginning to bring results.

Application of priorities on aluminum and magnesium is having an immediate effect on foundries producing castings of those metals for other than defense purposes, and the influence of the present situation on that branch of the foundry industry may extend far into future years. With the establishment of priorities has come the push toward the use of substitutes, particularly plastics. The plastics industry has been quick to sense the possibilities of the situation, and in recent weeks many newspapers have devoted considerable space to stories on the growth of that industry and the substitution of plastics for castings and products produced of metals by other methods of fabrication. In some cases effort is being made to sell the public on the idea that these are not substitutes, but that plastics provide a more superior product. The question naturally arises as to what the foundry industry as a whole is doing now and will do in the future to protect a market which it will want and need when the civilian population again becomes the most important market for industrial products. *Now is not too early* to give some thought to ways and means of overcoming the damaging effect of ever increasing dislocations in the normal demand for cast products.

Welcome to Number Twenty

FORMATION of the Western Michigan Chapter early in March marks another milestone in the progress of the American Foundrymen's Association, and should prove especially gratifying to the officers, directors, home office staff and the entire membership. Since the granting of the first chapter charter to Chicago in 1934, the development of the chapter movement has been one of the important functions of the national organization. Because chapters have opened an entirely new field, several thousand foundrymen are meeting monthly in different locations throughout the country to learn more of the advancements in the art of making castings and to become better acquainted with one another. Never before in the history of the foundry industry have so many men been at work furthering the technical progress of the industry. Due to this activity and the training it provides, chapters today are providing the leadership for many of the activities of the national association.

So congratulations to the association on making it an even twenty, and the best of luck to the baby chapter.

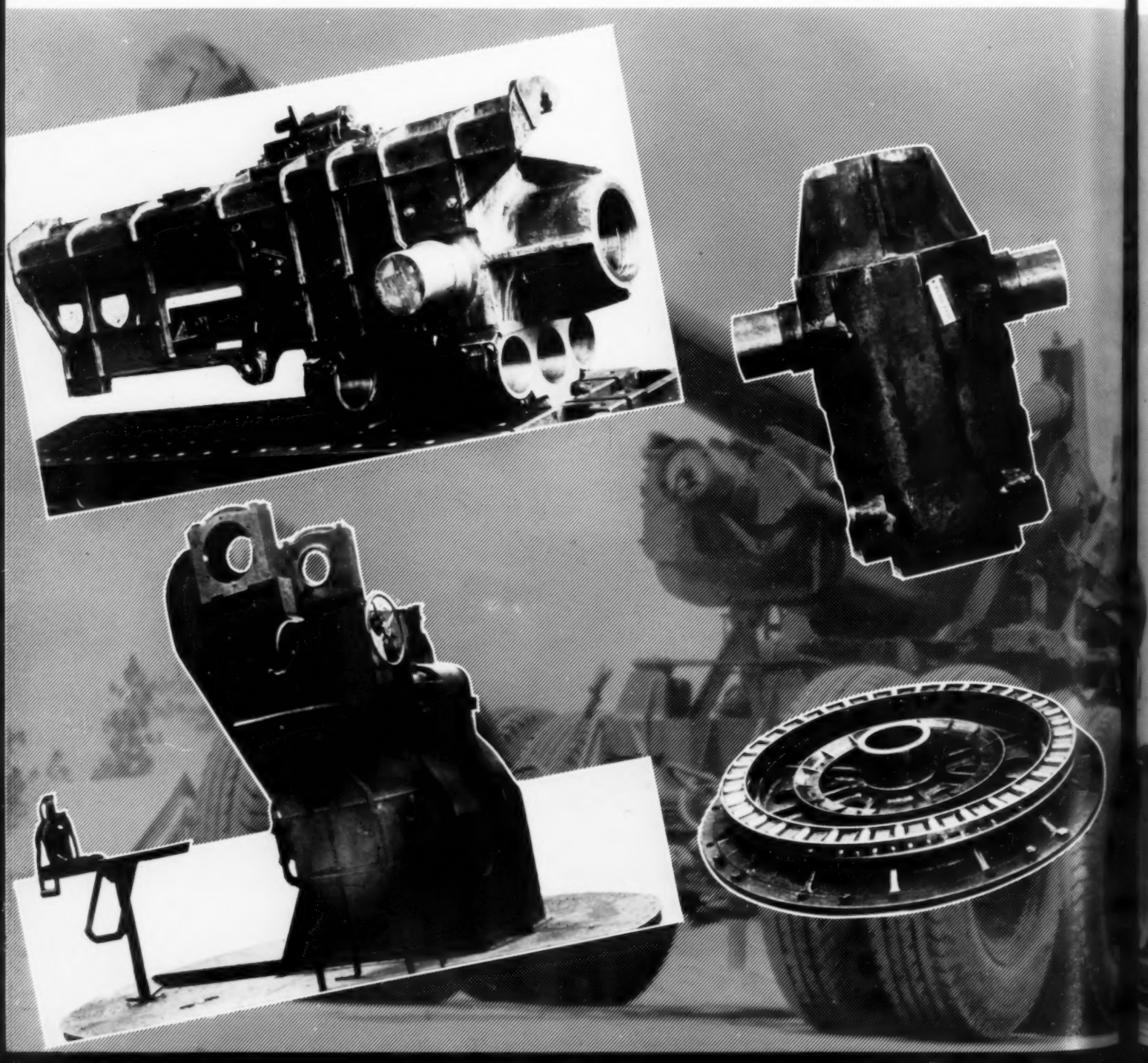
Frank G. Steinebach

Editor

Arsenal Insists On High Standards ☆ ☆

By Pat Dwyer

TO SLIGHTLY paraphrase the late Sir Walter Scott: "Breathes there a man or woman with soul so dead who has not felt the neck hackles and the temperature rising when the United States Marine Band, vocal and instrumental, goes to town as the saying goes on the famous, favorite and rousing number *The United States Marines.* With becoming modesty the first verse sets forth that from the halls of Mon-te-zuma to the shores of Trip-o-lee,



they fight our country's battles on the land and on the sea. First to fight for right and freedom and to keep their honor clean, they are proud to claim the title of United States Marines.

With a fine, characteristic, traditional and wholehearted disregard for the beautiful virtue of truth they cheerfully ignore the efforts and records of other arms of the service. The official motto is Semper Fidelis rendered into English by the ordinary scholar as Always Faithful. The marine is not an ordinary scholar. He renders the motto as Always First. In a nice and polite way the third verse hints: If the army and the navy ever gaze (note that ever) on Heaven's scenes, they will find the streets are guarded by the United States Marines!

Just to keep the record straight these easy going, gentle and amphibious leather neck sons of Mars let it be known that Our flag's unfurled to every breeze from dawn to setting sun. We have fought in every clime and place where we could drag a gun. In the snow of far off northern lands and in sunny tropic scenes, you will always find us on the job, WHO? The United States Marines!

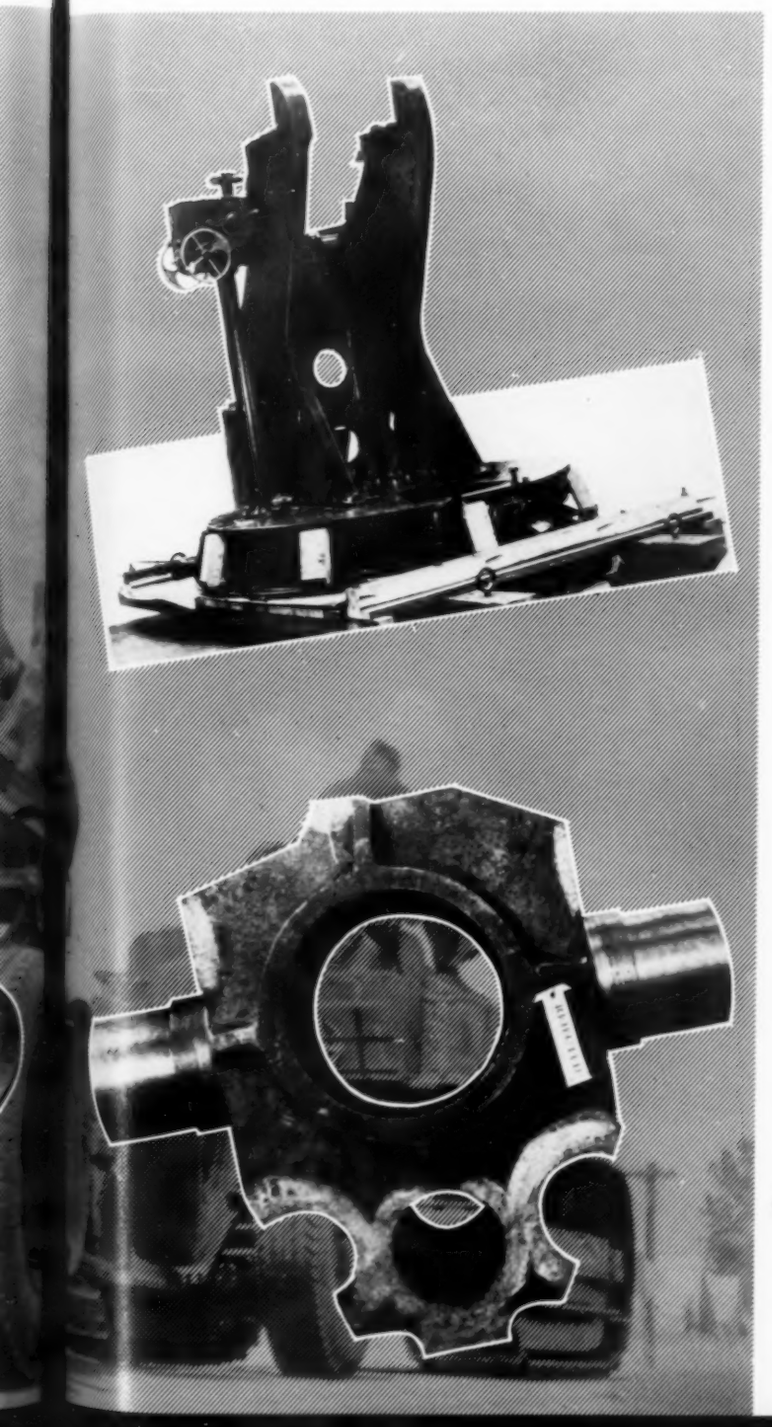
Exploits of the Marine Corps, the men of the air, the army and navy of the United States form the base of a great deal of historical fiction and the front page stories of newspapers in recent years. Maybe that is a distinction without a difference. The patriotic reader is proud of what has been done and what is to be done in the immediate future, but it is safe to say that the average reader has no more conception of related civilian activities than Jiggs IV, famous bulldog mascot of the Marine Corps in his exclusive dog house at Quantico.

Who makes the rifles and big guns, the air craft and the battle ships with their junior relations, cruisers, destroyers, tankers, repair ships, coast guard and patrol and other variations almost without number? Who builds and operates the transportation facilities? Who puts up the buildings and who builds the scientific and mechanical equipment for testing, fabricating and assembling every item in the infinite list required to carry on a war of defense or aggression?

Industry Flooded With Orders

Who indeed! With the avalanche or tidal wave of war orders flooding the country and apparently growing in volume from day to day, it is doubtful whether the prolific statistical department at Washington armed with a flock of adding machines which if placed end to end would extend the length of Pennsylvania avenue —a good place for 'em, according to some self-constituted authorities—it is doubtful if even this well organized department could offer a guess on the number of people now actively engaged in work directly connected with the defense program. Even if the figures were available and openly published they would convey no more meaning to the average man than the figures published regularly showing the value and allocation of government contracts. The popular feeling is, "Step up boys. This is on the house!"

Since speculative and random information is of neither value nor interest, let us avoid any further generalities and consider briefly some phases of one plant actively engaged in the production of military equipment and supplies. This



Reject tags on two partly machined steel castings indicate the rigid inspection which follows production from start to finish. Background photo courtesy U. S. Army Signal Corps.

is the Rock Island arsenal, located as the name implies on Rock Island in the Mississippi river, facing Davenport, Iowa on the north shore and Rock Island, Moline and East Moline on the south shore. In one of its many vagaries the Mississippi in this district flows from East to West, an item very confusing to strangers accustomed to the general belief that the great river flows south from a point far up in Minnesota to the outlet in the Gulf of Mexico.

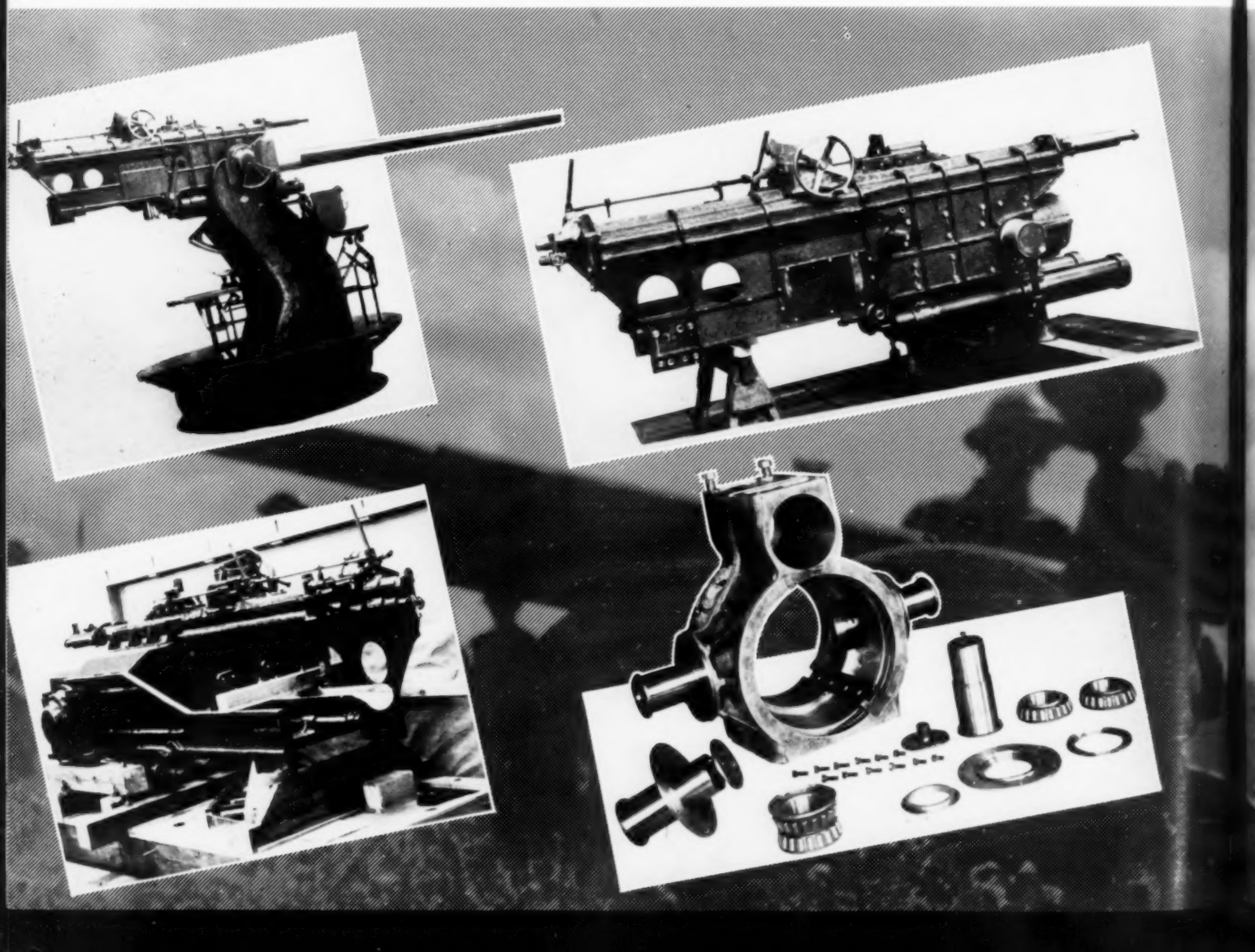
Island Was a Prison Camp

During the war of 1812 a small fort was erected at the western end of the island to serve as headquarters for troops operating in the Mississippi valley. A few years later the fort was a fairly important factor in settling certain bickerings with Black Hawk and his Indians. During the Civil war the island was converted into a camp for Confederate prisoners. Margaret Mitchell includes a description in her literary masterpiece *Gone With The Wind*. Out of a total of 13,000 men, 2000 died on the island. They were buried in straight military lines in a section of the island set apart for the purpose. The rows of head stones still are in existence and the cemetery is maintained as a unit of the National Park System.

Actual construction of the arsenal was initiated during the Civil war period. General Rodman, a remarkably able technician and administrator conceived and prepared plans for the arsenal. As Chief of Ordnance, United States army, General Rodman revolutionized foundry methods for casting cast iron cannon by running water through the core arbor. Development of the process for making steel guns changed the picture completely. Just another example of the manner in which the military and naval and in later years the aviation branches of the government service constantly strive for higher standards of performance. Incidentally, the main avenue extending through the center from one end of the island to the other, is known as Rodman avenue.

Improve Quality of Aluminum Bronze

Development of a special type aluminum bronze is fairly typical of the manner in which foundry practice, scientific knowledge and research and constant striving for improved physical properties are combined. Soon after the World war various combinations were tried in the arsenal foundry with a view of improving on the straight aluminum bronze of the period containing copper 89 per cent, iron 1 per cent and



aluminum 10 per cent. Addition of small amounts of manganese-copper and increase in the iron content improved the physical properties of the metal to a remarkable extent. Although the exact formula is not available for publication, it may be said that the analysis approaches that of aluminum bronze class *A* Federal Specification *QQ-B*671. Under the specification it is not classed as heat treatable.

About 3 years ago a demand for some real high tensile bronze suggested that the possibilities of heat treating had not been exhausted. The result was the production of a set of test bars which after suitable heat treatment showed a yield point of 60,000 pounds per square inch with an elongation of 8 to 12 per cent in 2 inches. Castings of this metal are used extensively for high strength and wearing parts in machine guns.

In many ordnance parts light weight and high strength are essential. Metal to meet these conditions is in Class 4 Federal Specification *QQ-A*-721a. The analysis is (*Please turn to page* 128)

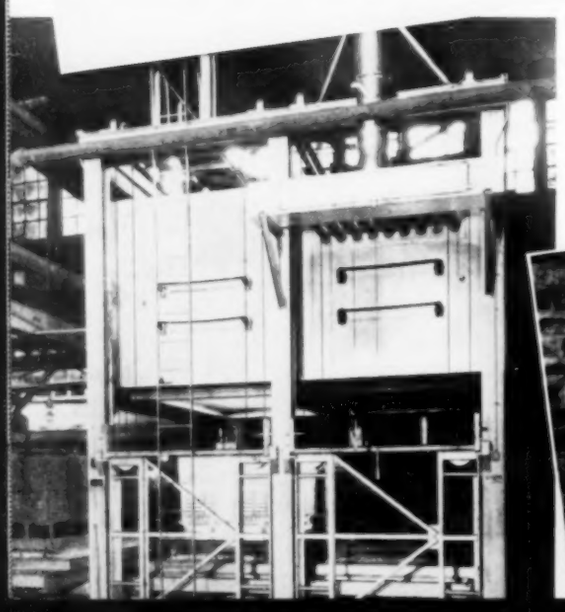
Intricate steel castings enter extensively into big gun assemblies. Background photo courtesy U. S. Army Signal Corps. Right—Brig. Gen. Ramsey, commanding officer Rock Island arsenal

ANNEALING *Malleable Castings* IN ELEVATOR F

FURNACE equipment required for annealing malleable iron is varied, and in some cases extensive, depending upon the rate of production, analysis of the iron, and the cycle of annealing required. The elevator-type annealing furnace is designed for application in small foundries, in foundries with intermittent production, for handling peak production loads, and for experimental work.

It is a flexible unit for applying variable cycles of annealing and may be supplied in multiple units for handling production of specific cycles to obtain the maximum furnace efficiency. Under certain conditions, the economies will approach the efficiency of a continuous furnace equipment for the same operation.

The General Electric Co., Schenectady, N. Y., recently has installed a multiple-unit, elevator-type furnace equipment in the foundry of a mid-western manufacturer as shown in Fig. 4. The equipment consists of two elevated furnace chambers. One furnace chamber heats the charge to a predetermined temperature and holds or soaks the charge at that temperature for a predetermined length of time. The second furnace chamber cools the charge rapidly, with an automatic cooling system, to a point just above the critical temperature. The charge then is equalized at that temperature and slowly cooled automatically, through the critical temperature, to a temperature where no scale will be produced on the castings after they are removed from the furnace. The charge then is removed from the furnace.



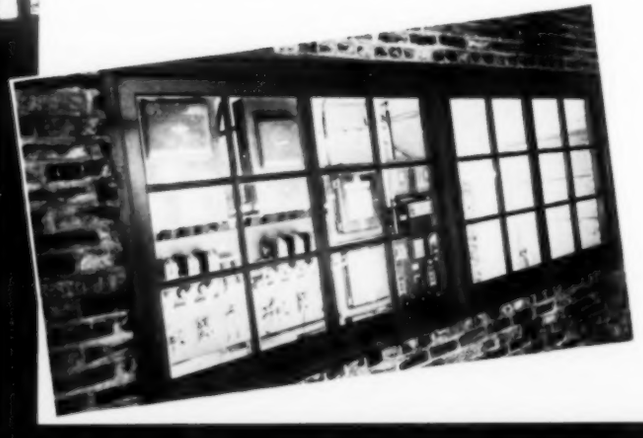


Fig. 1 (Upper left)—Car for electric elevator furnace without brickwork. Fig. 2 (Left)—Two-chamber elevator type furnace for annealing malleable cast iron. Car loading platform 51 x 102 inches with loading height of 34 inches. Furnace rated total 360 kilowatts with 210 kilowatts in high temperature chamber, and 150 kilowatts in low temperature chamber. 220 volts, 3-phase. Fig. 3 (Below)—Control room

R FURNACE

By R. E. COX
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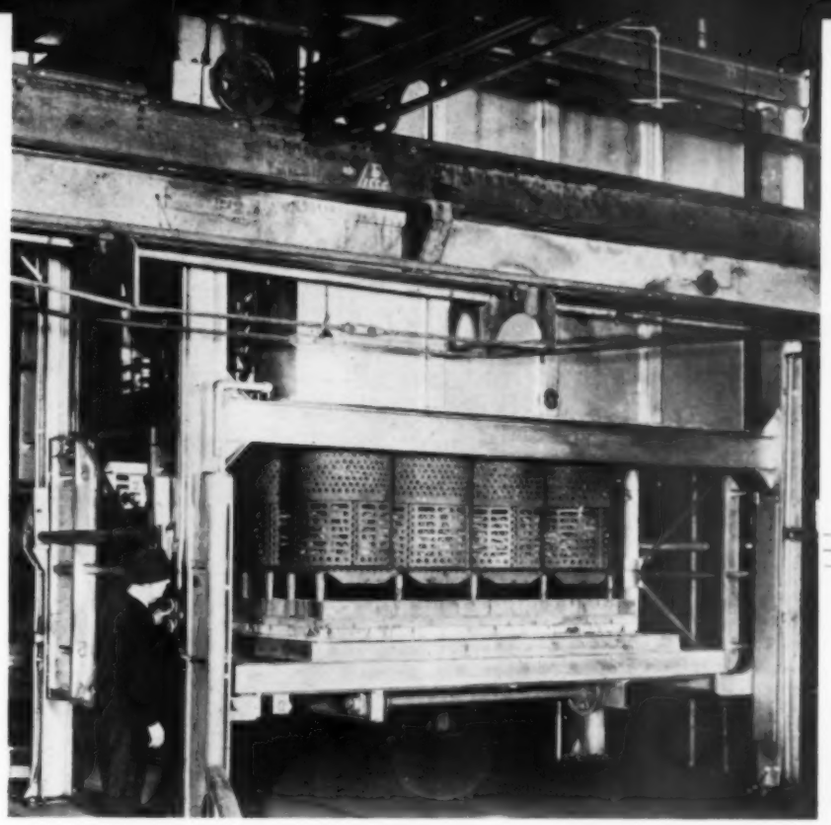


Fig. 4—View of the 2-chamber type furnace showing the load being elevated into the high temperature chamber

Heating and holding furnace of the equipment is used for that purpose only. Therefore, it is not necessary to reheat the furnace walls from a lower temperature each time a new charge is placed in the furnace as would be the case where only one furnace chamber is used for the complete cycle. The cooling chamber likewise is at a low temperature when the charge is transferred from the heating furnace. Consequently, it is not necessary to cool the furnace walls thereby saving considerable time and cooling energy. Due to those reasons, the double chamber furnace has the maximum possible economy for that type of equipment and furnace cycle.

Heat Only For Warming

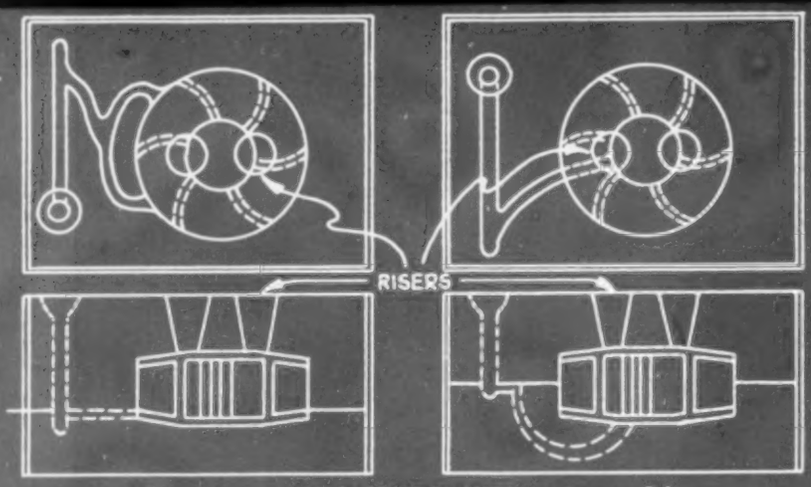
Furnace chambers are heated by ribbon resistor type electric heating units. There are 210 kilowatts installed in the heating and holding furnace, and 150 kilowatts installed in the cooling furnace. It happens that no heat is required in the cooling furnace on the particular malleable cycle employed, except for originally warming up the furnace chamber. However, the furnace equipment was designed to make pearlitic malleable in addition to the regular malleable, and it was necessary to install the previously mentioned amount of heat in the cooling furnace.

Automatic cooling is accomplished in the cooling chamber by installing a series of tubes in the roof. Those tubes extend through the furnace walls at the end, and are attached through a header to a blower which supplies air as required for cooling purposes. Both ends of the cooling tubes are brought out of the furnace chamber through packing glands, and therefore, the cooling air does not come in contact with the inside of the furnace or the charge therein. When the control calls for cooling, the blower automatically is started to supply air through the tubes which cools the atmosphere inside of the furnace chamber, and in turn cools the charge.

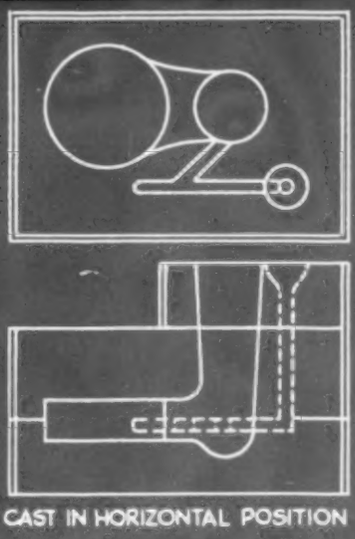
Load Carried on Steel Frame

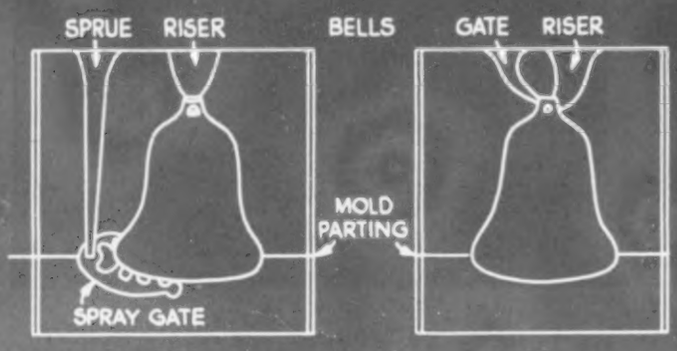
The charge is loaded into round alloy boxes as shown at the right in Fig. 4 which are stacked two wide, four long, and two high on a car. The latter is constructed with a raised alloy hearth construction, similar to that shown in Fig. 1. By use of that construction, the load supported on the hearth is transferred directly to the steel frame of the car by alloy posts, and relieves the brickwork from any strain of supporting the charge. The brickwork is light weight insulating material and heat loss through the brickwork is reduced materially. Heat absorbed by the brickwork also is reduced. Those benefits materially add to the efficiency of the equipment.

Control of the annealing cycle is accomplished automatically by program controllers. The controllers are arranged so that the control can be made manual if desired. Control equipment is shown in Fig. 3. Method of operation of the annealing cycle control and furnace equipment may be understood better by following the operations as they occur in one typical annealing cycle. (*Please turn to page* 113)



22. ROTARY PUMP RUNNERS 24.





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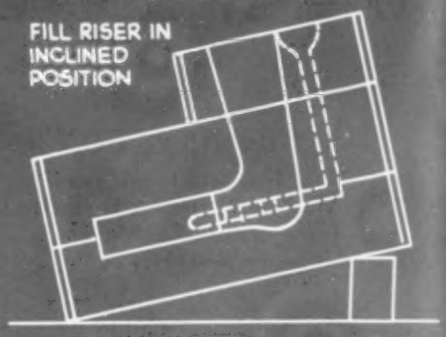


26.

GATING

Nonferrous Castings Is Important

PREVIOUSLY in the March issue it was pointed out that two or more methods of gating a given casting generally are available which will yield a good casting if all other conditions remain constant. Choice between methods depends upon convenience, equipment available, personnel and its experience and other conditions which may make it imperative that one particular type of gating should be chosen.

Where quantities of castings are to be made and some question arises on choice of the right gating, an intensive study and series of experiments frequently will be of inestimable value. Such tests should be conducted from several viewpoints. First, of course, is that of sound castings. Quite and perhaps equally important is the question of production cost including the cost of the removing gates and risers.

In making studies a satisfactory method of determining the quietness of the flow of metal into the mold is to cut observation holes through the cope so that as the casting is poured the entering streams of metal may be observed. In some cases that casting may have to be scrapped because of the chunk of metal formed but in many instances it simply means another riser that can be cut off at small additional expense. Yet, the observation holes enable the foundryman to see whether the streams are squirted into the mold or not and to see whether these streams flow in several directions in the mold cavity to form puddles which later unite resulting in scum spots or defects ordinarily hard to explain.

Observation holes also permit study of the desirable mold position during the pouring operation. For example, whether it should incline one way or the other. Also it allows locating the

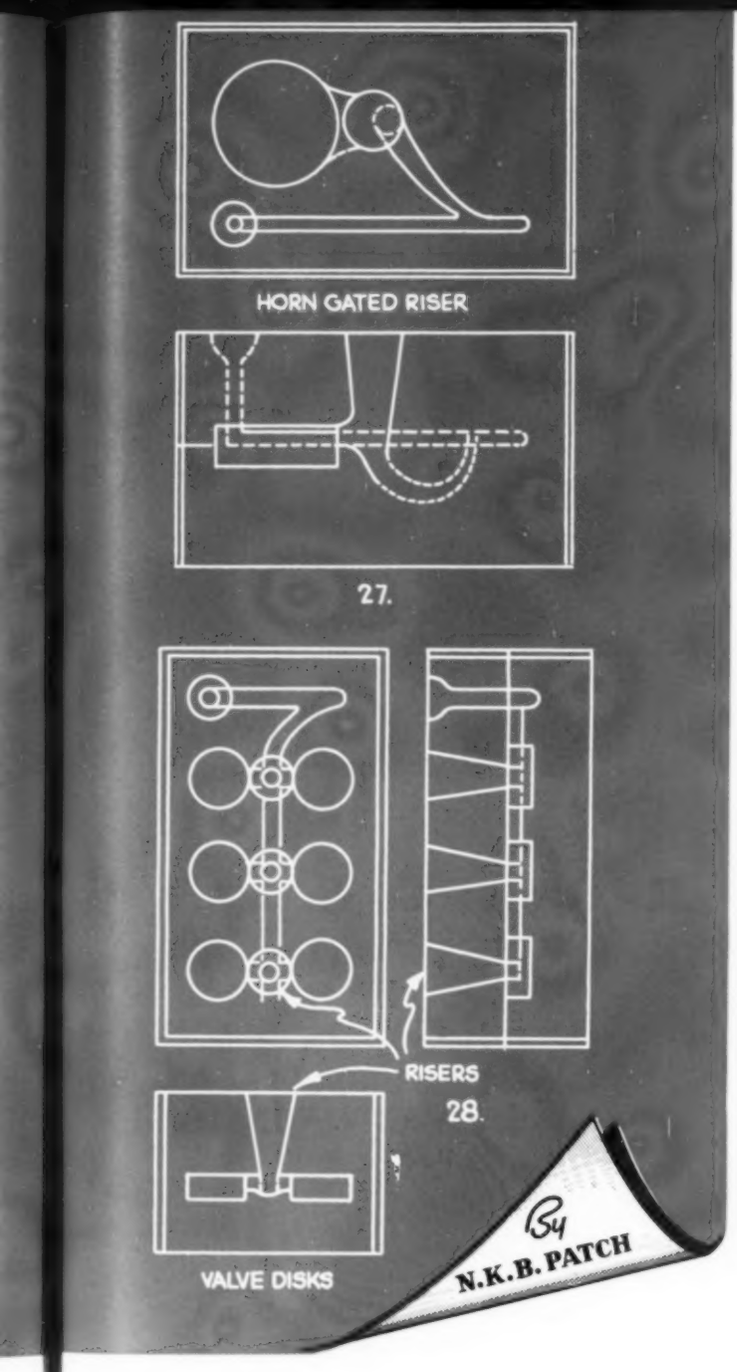


Fig. 22—One method of gating a rotary pump runner. Fig. 23—Bells may be gated at the bottom through a spray gate. Fig. 24—Rotary pump runner gated at center with horn gate. Fig. 25—Sometimes bells are gated at the top. Fig. 26.—One method of gating a valve disk showing initial and final mold positions. Fig. 27—Another method of gating a valve disk with a horn gate feeding into the riser. Fig. 28—A satisfactory procedure for gating and risering small valve disks made in multiple in a single mold

sprue to give the most satisfactory results including progressive cooling of the casting so that the last point to cool will be next to the freezing riser. That procedure also enables the foundryman to study the use of restrictions in gates, proper location, and other conditions influencing the uniform flow of metal from several gates into the casting. Obviously, if several gates lead metal into the casting, they must operate uniformly and not flow periodically or spasmodically to form globules or puddles of metal which solidify and later must be remelted by the rest of the metal in the mold or else form cold shuts or seams in the casting.

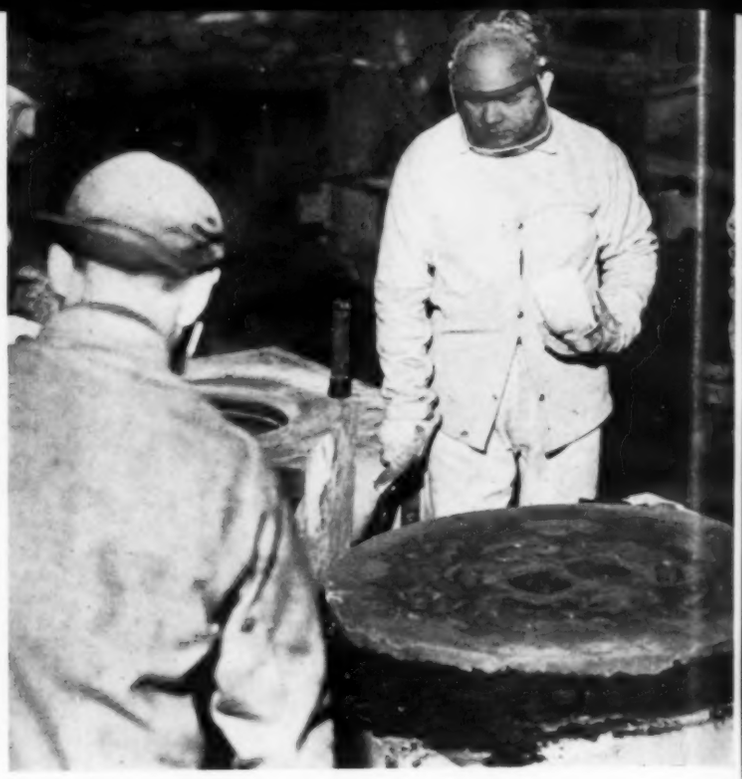
A few experiments of that kind frequently will indicate a definite trend toward the right kind of gating for mass production of castings at minimum costs with a minimum of rejection. That is particularly true where the castings must be subjected to pressure and therefore, are likely to give trouble if they leak. Frequently, castings that appear sound to the naked eye will develop leaks when subjected to water, steam or fluid pressure of any kind. Those leaks are definitely traceable to improper gating of the casting which permitted heavy sections to cool at the wrong time without proper feeding.

Had the gates been arranged so that the cooling took place progressively with the last point to cool being nearest the feeding riser, no such leakage would have occurred. That, of course, presupposes use of the proper alloy for such types of castings. But even where alloys are on the borderline for use under hydrostatic pressure, the soundness of the metal in the casting is a material factor in successful application. Consequently, gating which influences casting soundness should be chosen rather than gating which produces the best looking casting from a surface inspection only.

In studying choice of the right gate the relative size of gate should be considered carefully. Also the points where the metal is led into the mold, the point where the sprue is located, and the point or points where the risers may be located, must be considered. A gate that is too large may not cool rapidly enough when pouring ceases to insure solidification in the proper progression. A gate that is too small will result in an insufficient flow of metal.

Good practice dictates use of a minimum number of gates since each additional one means expense in removal, some marring of the outer surface of the casting and consequent possible deformation. Each additional gate means more metal must be poured into the mold and remelted after removal. Each time the metal is remelted some definite melting loss takes place. All of those items are expense items which must be kept down to secure the minimum cost figure.

There is much debate among foundrymen on whether the gates should be cut in the cope or in the drag. This question will never be decided definitely because some castings are gated better with the runner in the drag. The practical man with requisite experience can determine the proper arrangement without excessive experiment or study, but we (*Please turn to page* 126)



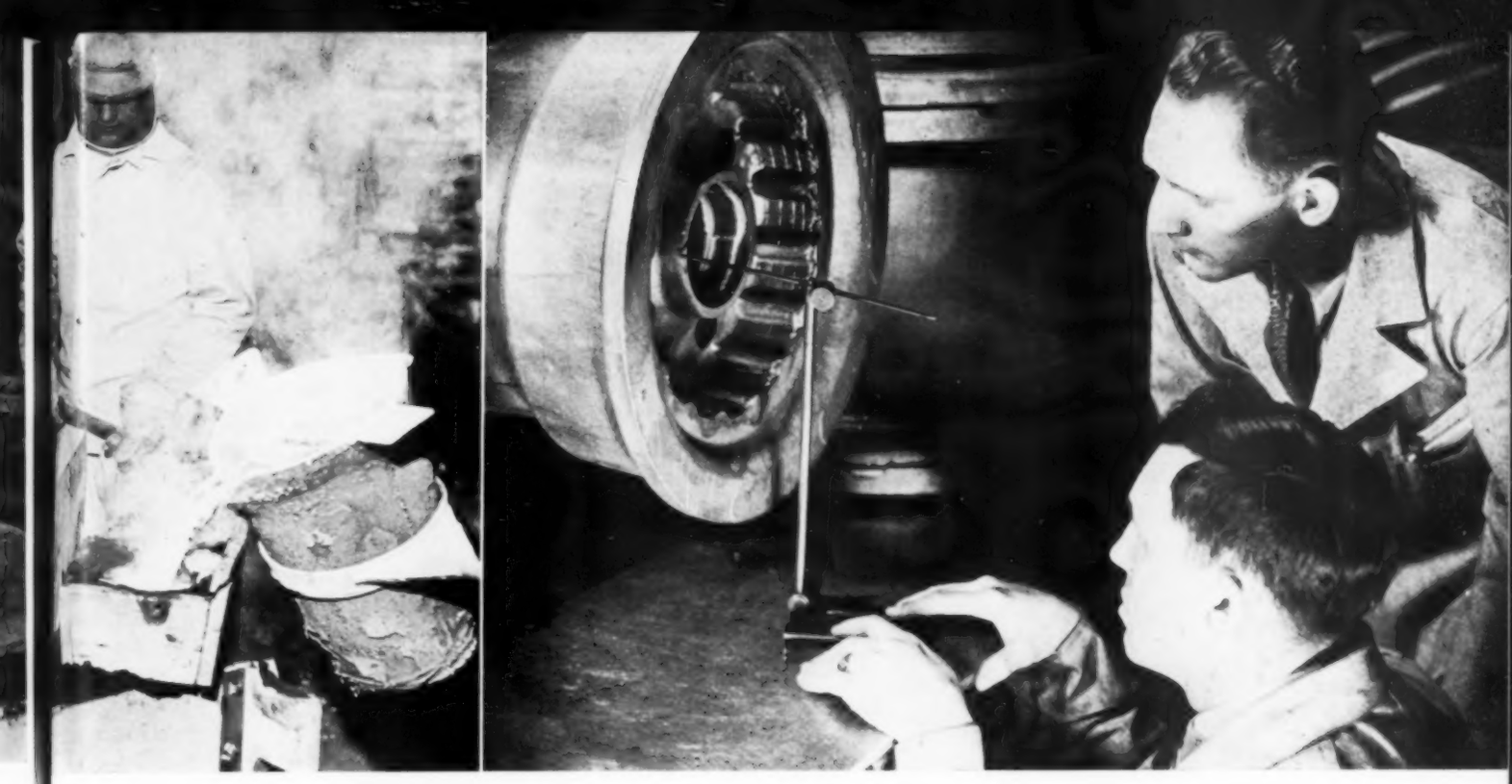
PRODUCING S

By M. E. BROOKS
and A. W. WINSTON
Dow Chemical Co.
Midland, Mich.

MOLDING of magnesium alloy castings is probably the most important single phase of the entire foundry procedure. While it is desirable in the founding of all metals that the mold should be so constructed that the metal will flow into the mold cavity smoothly and with a minimum of turbulence, it is vital necessity with magnesium alloys and deviation from this basic foundry rule will result in scrap castings.

Excessive turbulence in the metal stream from the time it leaves the melting unit until the metal has reached its final place in the casting

Fig. 8 (Left above)—High speed band saws are used for trimming the rough magnesium castings. Fig. 9 (Left)—Important engine castings frequently must be tooled to remove sand pits and other minor surface imperfections. Fig. 10 (Above)—Pouring a magnesium casting is a fascinating and important step in the process. Fig. 11 (Right above)—Final step before shipment is a last inspection to insure quality, dimensional accuracy, and in case of landing wheels, the concentricity on which balance depends. Photos courtesy Dow Chemical Co., Midland, Mich.



SAND CASTINGS OF Magnesium Alloys

will cause oxide skins to become mixed with the metal. These oxide skins, being of about the same specific gravity as the metal, do not separate from the metal but are swept into the casting where they tend to rise to the cope side and appear after sandblasting as surface defects.

In addition to the surface defects caused by the oxide skins, a further result of turbulence in the metal stream is the entrapping of bubbles of air which also tend to rise to the cope surface and are opened up during cleaning operations and appear as blows or gas holes.

To avoid turbulence in the mold, the casting should be gated in such a way that the metal will be brought into the mold cavity at the lowest point and the gates so arranged that the sprue can be filled as quickly as possible after pouring starts. The use of a pouring basin and some type of a filter placed at the bottom of the sprue are very effective aids in keeping out oxide skins and smoothing out the metal stream flowing into the mold.

Two types of filters used are : (1) perforated skim gate, and (2) steel wool. To be effective, either of these materials should be placed at the bottom of the sprue or in the horizontal runners in such a way that the metal must flow through them on its way into the mold cavity.

Two types of sprues are used, round and rectangular slots. The round sprue is molded more easily and commonly is used in conjunction with the perforated skim gate. The rectangular slot sprue is claimed to decrease turbulence because of the prevention of any swirling tendency of the metal. It is used either without any filter material or with steel wool. In any case the sprue must be of such a size that it can be choked easily so that all the opening from the bottom gate up into the pouring basin can be filled quickly to prevent oxide skins being washed down the sprue and into the casting.

The casting should be filled through a number of small gates rather than a few larger ones. This is desirable to avoid overheating of the sand at the gates and because the molten mag-

nesium loses its heat very rapidly and any attempt to flow metal any great distance through a thin casting section will result in misruns. A common type of gating is to place a ring runner completely around the casting with a number of small gates entering the casting uniformly around its circumference.

Risers are used freely to insure the soundness of heavy sections of castings. Because of the light weight and low heat content of the metal, it is necessary that the riser be connected as directly as possible to the section to be fed. It sometimes is found to be good practice to place a riser over a gate to hold up shrinkage in a section which is difficult to feed by direct risers.

Metal Requires Heavy Risers

Compared to the practice with many other metals, the risers required for magnesium alloys are much larger and greater in number. The castings shown in Fig. 13 and Fig. 14 are fairly typical of the procedure followed on magnesium castings. Chills frequently are used to equalize the freezing of heavy and light sections. The same precautions should be observed in using chills in the green sand portion of the mold as were discussed under cores. Molds containing chills always are poured as soon as possible after closing to reduce the possibility of condensation on the chills.

Magnesium alloys for sand castings are melted by two methods, the openflux pot and the crucible. The former method uses a relatively large amount of fluid chloride-base flux (10-20 per cent of the metal weight) at the bottom of a large stationary pot. The flux serves the dual purpose of cleansing the metal and protecting it from oxidation. The (*Please turn to page* 108)

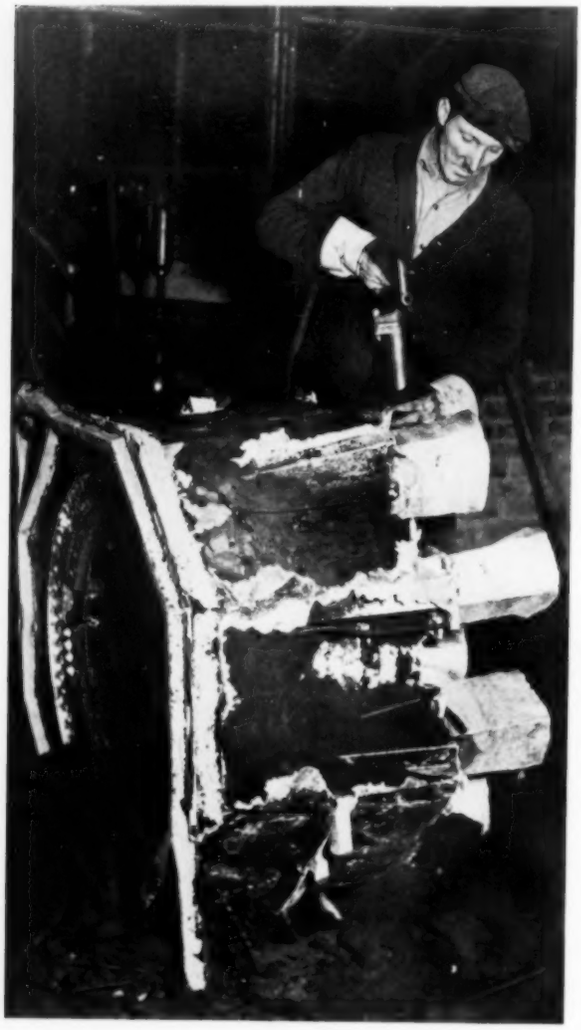


Fig. 12 (Left above)—Core knockout is made easier by vibrator, hammers and other pneumatic tools. Due to low heat capacity of molten magnesium, the core binder is not broken down, and large cores are hard to remove. Photo courtesy Magnesium Fabricators Inc., Adrian, Mich. Figs. 13 and 14 (below)—Ring runners, finger gates and adequate risers are customary in magnesium casting practice. Photos courtesy Dow Chemical Co., Midland, Mich.

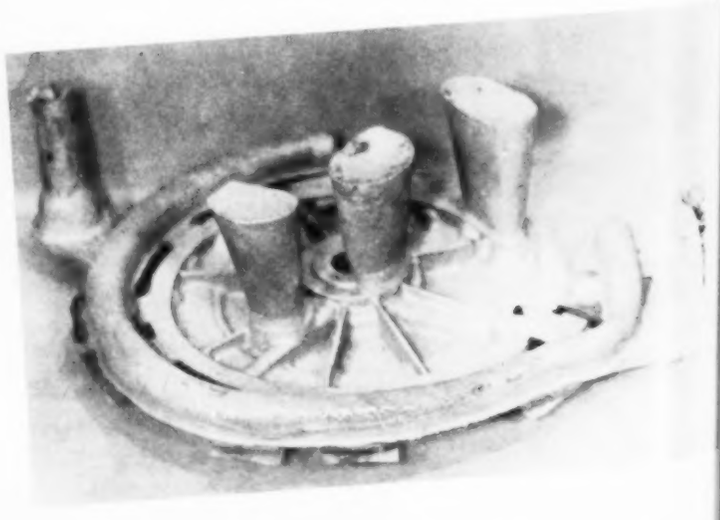


Photo courtesy
Empire State Observatories

CHAPTER COMMITTEES PLAN CONVENTION ACTIVITIES

COMMITTEES organized by the Metropolitan Chapter of the A.F.A. are proceeding actively with plans to dispense the hospitality of the Empire City to those who will attend the annual convention of the American Foundrymen's Association in New York from May 12 to 15. Headquarters of the convention will be the Hotel Pennsylvania, and all meetings will be held there. Various groups arranging for such features as plant visitation, ladies entertainment, annual dinner, are comprised of foundrymen as well as equipment and supply manufacturers and dealers. The Metropolitan committees are under the direction of Sam Tour, Lucius Pitkin Inc., New York, as general chairman, and Donald J. Reese, International Nickel Co. Inc., New York, as general vice chairman.

All Eastern Chapters Co-operate

Metropolitan chapter committees are receiving close co-operation of other chapters and foundrymen's associations along the Atlantic seaboard to make the convention meeting an outstanding success. Representatives of those organizations include: Theodore Janet, Hinrich's Foundry Co., Brooklyn, representing the Grey Iron Foundries of Greater New York; William Paulson, Thomas Paulson & Son Inc., Brooklyn, representing the Metropolitan Brass Foundrymen's Association; John L. Carter, Newark, N. J., representing the New Jersey Foundrymen's Association; L. H. Denton, Baltimore, representing the Chesapeake Chapter, A.F.A.; George R. Holmes, McLagon Foundry Co., New Haven, Conn., representing the Connecticut Foundrymen's Association; E. H. Ballard, General Electric Co., West Lynn, Mass., representing the New England Foundrymen's Association; R. J. Keeley, Ajax Metal Co., Philadelphia, representing the Philadelphia Chapter, A.F.A.; and Louis G. Tarantino, Bridgeport, Conn., representing the Connecticut Nonferrous Foundrymen's Association.

In addition to officers previously mentioned, chairmen of various convention committees of the Metropolitan Chapter of the A.F.A. are as follows:

Reception committee—D. Polderman Jr., Whiting Corp., chairman.

Ladies Entertainment committee — Don J. Reese, International Nickel Co. Inc., chairman; Mrs. Sam Tour and Mrs. D. J. Reese, co-chairmen.

Banquet committee — Henry S. Washburn, Plainville Casting Co., Plainville, Conn., chairman.

Plant Inspection committee—K. V. Wheeler, American Steel Castings Co., Newark, N. J., chairman.

Transportation committee — T. D. Parker, Climax Molybdenum Co., chairman.

Hotel committee — W. A. Phair, Journal of Commerce, chairman.

Publicity committee—Fred G. Sefing, International Nickel Co. Inc., chairman.

Many Foundries in Vicinity

New York and the surrounding vicinity contain a wide variety of foundries, and sufficient will be available for plant visitation to meet requirements on size, ferrous or nonferrous, jobbing or production, etc. Foundries along the Atlantic seaboard have felt the pressure of defense work for some (*Please turn to page* 114)

AROUSE INTEREST IN Safety

By L. C. WILSON
General Manager
Reading Steel Casting Division
American Chain & Cable Co., Reading, Pa.

SAFETY in shops has received more and more attention with the progress of years and today takes as prominent a place in shop practice as do quality of product, cost of product and other items which go into the process of manufacturing castings.

To get the proper perspective we must substitute some word for interest. I believe that safety consciousness more definitely defines the intangible something with which we are attempting to deal. With this substitution, safety consciousness is as important in supervisory jobs as are the elements of production, quality, cost and all other parts of the job of making castings. If approached from that point of view, more definite progress can be made toward safer shops and better working conditions.

Methods Apply To All Plants

We are supposed to discuss safety in a small plant. However, this brings before us the question of how to designate a small plant. Number of men does not seem to answer the question entirely, as it may mean a small number of employees where the head of the business gives his undivided attention to all details.

Again it may mean one with a much larger number of employees managed in identically the same manner by the chief, with little or no authority delegated to subordinates. From the point of view of safety it may mean a plant with a large number of employees but maintaining a safety program which segregates the separate departments, thereby making each one quite comparable to a plant with a small number of employees as in the first instance.

Photo courtesy Ford Motor Co.

Safety programs in all three instances should be handled in identically the same manner. Success of the safety program will be dependent upon the safety consciousness which is instilled in the men through the supervisory force but propelled by the head of the organization.

That leads to the first of ten phases of safety work which will be developed.

1. *Who is the key man on safety in the small plant?*

The chief, manager or head of a business should be the key man in either small or large business. By key man it is not meant what we sometimes describe as key men in industry, but the man from whom all inspiration, enthusiasm and direction originates—the head of the organization.

Safety consciousness starts at the top and always remains top responsibility. The burden of making safety plans and carrying them to a successful conclusion does largely, if not altogether, fall upon the shoulders of others in the organization who should be, (*Please turn to page* 118)

No Definite Limit Can Be Placed On Length of Chill Life

We use approximately 50 chills ¾ x 3 x 3½ inches in a core at the bottom of a 1200-pound iron casting with an average 3-inch thickness. If these chills are used a number of times will they influence the casting and if so in what manner?

Small chills ¾-inch thick are not heavy enough to change the composition in a casting 3 inches thick. Their only effect is to densen the metal immediately in contact with them. This effect is brought about by extracting the heat more rapidly than where the casting is in contact with sand. So far as the effect of the chills on the casting is concerned they may be used repeatedly until they begin to develop fire cracks. These cracks in themselves would not interfere with the usefulness of the chill as a heat extractor. Unfortunately the inside of the cracks become rusty and every foundryman knows that rust will explode violently in the presence of molten metal.

Some of the gas may work free, but a considerable amount will remain trapped in the metal in the form known as gas pockets or blow holes. Active life of the chills depends to a considerable extent on the composition of the iron. Obviously an alloy iron highly resistant to heat and growth will last longer than a plain cast iron. However, in the present instance where the chills are small and where the cost of molding is practically nothing, almost any iron from the furnace will function satisfactorily. Effect on a casting of old or new chills is just the same provided they are dry and clean.

Flat Back Bracket Castings Are Troublesome To Produce

We expect to cast aluminum bronze brackets, which will be flat back with two ribs on either side. Each casting will weigh approximately 8 to 10 pounds. We would appreciate any information you may give us on the melting, casting and molding of an aluminum bronze containing 79 per cent copper and 10 per cent aluminum. Would you recommend the use of a dried sand strainer core with aluminum bronze, or would this have a tendency to make the metal drossy? About what size sprue should we use?

Your problem of casting a flat surface of uniform thickness with flanges at either end is one of the most annoying problems in the foundry industry, particularly in a high shrink alloy, such as aluminum bronze. Most foundrymen find it desirable to cast flat pieces on edge with the riser attached to the top so that cooling takes place progressively from the bottom to top. The top, last to cool, is fed from the riser.

The problem is to attach the risers so that they are removed economically. This is done in different ways by different foundrymen. Some use a riser all the way along the top attached by a web that is somewhat thinner in the cross section than the thickness of the plate. The web is very short, not to exceed ½-inch between the casting and the riser. Others use round risers at the corners. Those are high so that ample static head is available to supply the feeding pressure along the entire top edge. Metal should be brought into the mold at the bottom in a very quiet stream or streams if the size of the plate is such that several streams are necessary to fill the mold.

All of these streams must be led into the mold without any tendency to nozzle or spray. That is accomplished by providing an ample sprue. Also provide the necessary restrictions in the gates at several points to hold back the force of the downward flow of the metal so that it flows into the mold cavity steadily and quietly.

The metal should be melted carefully and not heated beyond the necessary pouring temperature. Preferably in the case of aluminum bronze or other high shrinkage alloys it is desirable to make up the alloy first and pour off into ingots and then remelt the ingots under the most carefully controlled metallurgical conditions. In this way the metal finally reaching the mold is as free of gas absorption as possible. All copper base alloys, particularly aluminum bronzes, are highly sensitive to underburnt furnace gases and, therefore, should be subjected to their presence for the minimum length of time.

It will not be difficult to work out by a series of tests, the right size of runners and right size of sprues, if precautionary measures are carefully taken into consideration in making the plans. For the production of the castings a very good method would be to make the casting entirely in a deep cope with the riser at the top of the casting and the sprues passing through the cope with the necessary runners, gates and restrictions described cut in the lower side of the cope or in the drag as convenience dictates. In this way, the minimum amount of labor expense would be entailed and yet a good opportunity for the study of the size gates, risers, etc. is available to the person making the investigation.

Dull Iron Is Cause Of Cold Shuts

We are forwarding a small gray iron casting and will appreciate your opinion on the cause of certain defects, irregular light line indentations on the cope and drag side. Two patterns are mounted on a plate which we have used for the past 10 or 12 years without any trouble.

The small indentations are cold shuts, the result of pouring iron at too low a temperature. The iron may have been too cold leaving the furnace, or more probably it was melted quite properly and then for some reason remained too long in the ladle, or was poured as the last iron from a ladle employed in pouring many castings. Unlike water or other liquids, molten iron develops a film as the temperature drops. The film gradually increases in thickness until the entire mass solidifies. Where two streams of iron meet in a mold they coalesce where they are hot and liquid. Where the film has developed sufficiently the streams meet but do not mingle. The film remains between. Obviously the remedy is to avoid the use of cold iron.

Melt Pattern Alloy With Much Care

We operate a foundry in Canada and expect to manufacture a large number of aluminum patterns shortly for production of artillery parts. The patterns will range in weight from six ounces to 80 pounds, and would like to have an alloy with light shrinkage which gives a smooth casting easy to clean up.

After considerable experimenting, one of the leading pattern firms in this country found that the composition of the alloy is not as important as the method and care used in melting. The alloy used contains from 6 to 8 per cent copper, 2½ to 3 per cent silicon, and remainder aluminum. Magnesium chloride is used as a flux because it does not fume as much as zinc chloride. To avoid trouble from unnecessary agitation of the metal, the firm melts in and pours from the same pot. Also in melting, the furnace is arranged so that the flame from the oil burner is not allowed to sweep over the top of the pot.

Pouring temperature of the alloy for general pattern work ranges between 1180 and 1240 degrees Fahr., but on thin-wall jobs such as driers the temperature may range up to 1340 degrees. There are a number of other points that might be mentioned, but we believe that a more thorough discussion is presented in the second of a series of two articles which were published in the December 1940 and January 1941 issues of THE FOUNDRY. The articles are entitled, "Patterns Demand the Best in Skill, Tools and Materials," by Vaughan Reid, and you will find much interesting information in them.

Plumbing Fittings Leak Badly

Our products require hydraulic test, and occasionally we run into extraordinary trouble with regard to leakage. We are sending two castings, both of which are running badly at the present time. One is a ground key cock and the other is a basin faucet which shows leakage above the flange.

You do not indicate the composition from which these castings have been made but we assume that it is one of the red brasses generally used in the plumbing supply industry. In the case of the ground cock the leak is located at the junction of a thick and thin section just as it is in the basin faucet. That is an indication of microscopic passageways opened up by the growth of crystals as the metal solidifies.

Obviously the correction is to cool the metal at the right speed or to add to the composition another element that will affect the crystal growth. Many manufacturers of plumbing supply equipment have found it advantageous to use a small percentage of nickel since it tends to reduce the crystal size and to refine the grain structure. If the composition you are now using does contain nickel possibly the content is low. The nickel content should be between 0.25 and 0.50 per cent.

Spasmodic appearance of defectives would indicate that the gating is capable of making good castings regularly if the metal is right. It also would indicate that possibly a change in pouring temperature is taking place when the castings are good or when the castings are bad as the case may be. Pouring at a too low temperature is likely to cause excessive grain growth at the points last to cool, in other words, at the heaviest sections.

Here is a case of where the designer and the foundryman could get together to reduce loss. A designer could help your troubles materially by changing the location of the valve seats in the basin faucet so that it would not come too close to where the large flange is attached. In the present design the valve seat and the flange are almost opposite one another, increasing the amount of metal at the point where they join the main tube of the faucet. That results in a slow cooling which causes grain growth, and must be compensated by risers or by the use of a chill if absolutely uniform results are to be expected.

However, if you have a large percentage of good castings under the present circumstances, you might increase the number of good castings by a careful study of temperatures, pouring speeds, moisture in the sand, to see that all are maintained at a standard level to insure uniformity of practice that would mean uniformity in product. The grain growth problem also is exhibited in the ground key cock casting but the condition is not quite so acute so that you probably do not have as many castings that are giving you trouble.

We believe it would simplify matters to add a light fillet to the pattern at the junction where the leaks now occur and the gate was placed to feed the heavy section at the point where the fillets are applied. We assume that these castings are made on a mass production basis so that gates, depth of the cope and the static head are standardized.

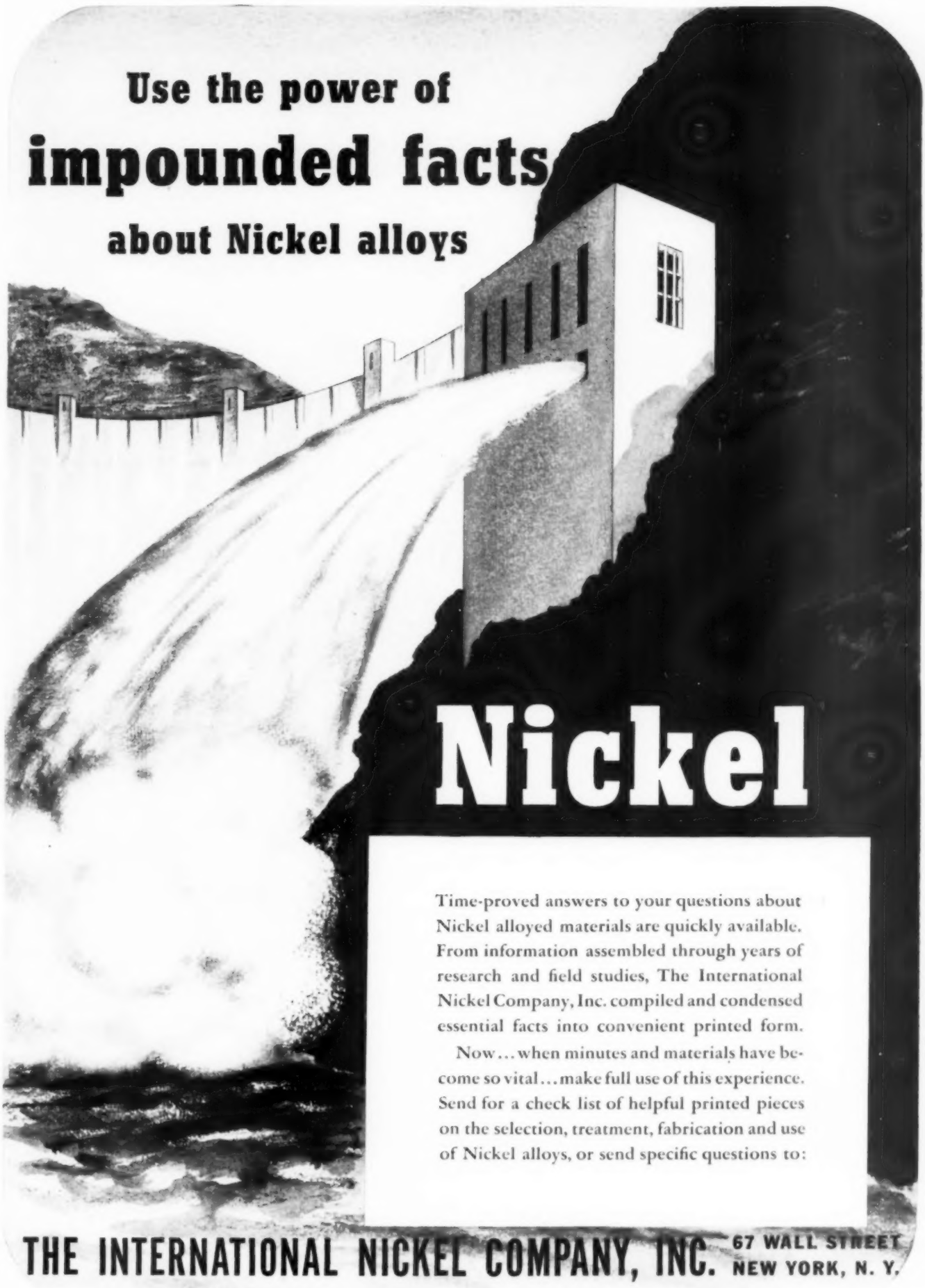
Rings and Flanges Not Fed Properly

We have been endeavoring to make in our brass foundry a number of orifice rings and flanges to withstand a hydrostatic test of 100 pounds per square inch, and an air test of 75 pounds per square inch. The castings range from about 1½ inches inside diameter by 5 inches outside diameter to 7¾ inches inside diameter by 13½ inches outside diameter. All of the flanges are 1¾ inches thick. The specification is A. S. T. M. B60 calling for 88 per cent copper, 8 per cent tin and 4 per cent zinc. The castings are porous and water at 100 pounds pressure seeped through them badly. We melt in a 240-pound gas-fired crucible furnace. We do not have pyrometer equipment for close temperature control. We have, however, attempted to heat this brass to a temperature of 2200 to 2300 degrees Fahr., but are dependent upon the experience and judgment of our foundry foreman for the correctness of this temperature.

You give no details as to the type of defects that are causing the leakage. If you had fractured the castings and found pinholes in them, particularly if they were bright in color, that would indicate that the metal had been gassed in the furnace during melting. We take it from the last part of your question that your defects are not of such magnitude as to produce real leakage but it is a question of seepage or leakage through microscopic imperfections.

Those are entirely the result of inadequate feeding of the alloy during solidification. The composition,

(*Concluded on page* 50)



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(*Concluded from page* 48)

although not generally recognized as one that needs much feeding, in reality demands a very definite feeding during the process of solidification, particularly when the problem of leakage or resistance to pressure is important.

Your disk castings should give no trouble if you will see that they are well fed by providing the necessary risers of adequate size. One method of molding them would be to cast them on edge with a 4-inch diameter riser leading from the top edge up through the cope but sharply reduced where it joins the castings so it does not distort the two flat surfaces of the disk. Gate so that the metal enters through a horn gate or any other convenient type of gate at the bottom but be sure to have this gate such that it will promptly freeze when the pouring has ceased. Riser should be the last to cool.

Another method would be to mold them flat and from one side cut an opening of adequate size connecting a large riser with the casting. Pour the metal through a sprue and gate which leads the metal into the riser and let the casting fill from the filling riser. The riser should be at least 6 to 8 inches above the top of the casting and preferably a little higher. It is perfectly practical by this method of gating to have two castings attached to the same riser, one on either side, provided the size of the riser is maintained in proportion to the demand of the two castings.

Pouring temperature you suggest is approximately right but you state you have no pyrometer to make sure that your temperature reading is accurate. With 4 per cent zinc present there is a tendency to have a zinc flare appear on the surface of the bath as it is agitated with a stirring bar when the temperature is beginning to reach 2200 degrees Fahr. A careful study of the amount of flare will help you to determine your relative temperatures.

The A. S. T. M. specifications limit use of nickel under a heading "other elements" to a maximum of 0.50 per cent. In this 0.50 per cent of "other elements" nickel logically might be included so it is perfectly reasonable even under the specifications to use nickel, say up to 0.30 per cent or even higher. However, the use of nickel will complicate the temperature control particularly without the presence of pyrometers, and furthermore, the presence of nickel requires a higher pouring temperature. We do not believe you should have a bit of trouble making perfectly satisfactory castings in this composition provided care is taken to melt the metal carefully in an oxidizing atmosphere and proper provision is made for feeding.

Composition Varies In Roll Casting

We are sending a small piece of metal broken from the gate of a 12-ton roll cast in a dry sand mold. The metal is brittle and shows variation in grain characteristics. In the roll the metal was not uniform, being harder in some places than in others and very hard to cut. Metal was melted in a 42-inch cupola with coke bed 46 inches above the tuyeres, 1000-pound metal charges, 120 pounds coke between charges, barrow load of limestone on the bed and 75 pounds on each charge. The charges were made up of 65 per cent steel scrap; 25 per cent pig iron; 10 per cent dryer scrap, 50 per cent steel; 1.75 per cent nickel; 2 manganese briquets; 2 chromium briquets. Pig iron analysis: Silicon 1.25 per cent, sulphur 0.047 per cent, phosphorus 0.086 per cent, manganese 0.85 per cent.

At one time or another over a period of a great many years we have either seen or heard of nearly every freak problem in the foundry. Yours is a new one. All we can do is hazard a guess. In all probability as a practical foundryman the same idea has occurred to you, but it is so opposed to what is considered common knowledge, you have hesitated to accept it as a solution. The cupola charge made up of several component parts does not melt simultaneously. Nevertheless under ordinary conditions a fairly uniform metal is obtained. The metal first is mixed in the well of the cupola, and later is mixed more completely in the ladle. Obviously extremely hot metal will mix more readily than metal at a lower temperature. This might be a factor if the alloys were added to the metal in the ladle. In this particular instance, 12 tons of iron probably tapped 1 ton at a time at 10 minute intervals over a period of 2 hours may not have united to form a homogenous mixture. The result was reflected in the casting.

Purify the Charges In the Cupola

Aluminum contamination in our cupola charges amounts to approximately 2.25 per cent and produces dirty castings filled with blow holes. We have tried increasing the amount of limestone between the charges, but apparently the treatment has no effect. How should the metal be purified?

You do not state whether the aluminum is combined chemically with the cast iron scrap, or if it merely is included in the form of component parts of machine assemblies. If in the former state we do not know of any practical method for separating the two metals. If in the second condition we suggest employing the nonferrous metal reduction technique. That is, raise the mass of metal to a temperature that will melt the lower metal component first.

The melting point of aluminum is approximately 1100 degrees Fahr., while that of cast iron is about 2100 degrees. The scrap could be thrown into a wood fire, into a heat treating furnace, or into the cupola after the wind is shut off at the end of the heat. That means handling the cupola charge twice. The question naturally will arise: Is the added cost justified? That point can be determined only by a person on the ground and thoroughly familiar with all the conditions. Basing an opinion merely on the facts as set forth in the inquiry our advice would be to sell the remainder of the contaminated scrap instead of trying to reclaim and use it.

Wants To Make Pure Copper Hammers

We want to make a copper hammer weighing about 2½ pounds with cored hole for the handle. Where should the gate be placed and if riser is needed where should it be placed? About what temperature should copper be for pouring?

We presume you are going to cast these hammers in an alloy of copper plus zinc and not from pure copper. Where pure copper is absolutely essential, they are usually made from rolled copper bars cut off to the proper length with the hole for the handle drilled into it. To cast pure copper in sand molds, there are so many variables that must be controlled that it is rarely done except where it is absolutely essential.

An alloy of 25 per cent copper and 5 per cent zinc would give a very good practical "pure copper" and yet it may be cast like any red brasses. Of course this does shrink more than some of the red brasses and, therefore, a riser must be provided. The usual way is to cast two hammers, one on either side of a good size riser. The riser is attached to the side of the end with an adequate gate so that connection between riser and casting is maintained in a fluid state as long as shrinkage is occurring, and the metal is led into the riser from the sprue by a runner in the cope. The sprue is maintained at the right size so that it may be kept full during the entire period of casting and the metal is poured at a temperature of around 2100 to 2150 degrees Fahr. If, however, the size and shape of the castings are such that a little colder pouring will still give good results, such a lower temperature is to be preferred.

The performance capacity of many cast iron parts is greatly improved by flame hardening. The problem is to find the proper irons.

Molybdenum irons have a wider safe hardening temperature range; cases are well bonded to cores; distortion is held well within allowable minimums. Hence the growing use of flame hardened Molybdenum irons for such vital machine parts as automotive engine cam shafts, bearing rings, lathe ways and die blocks.

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MOLY

MEN of INDUSTRY

I. M. JOHNSEN was made superintendent of the Cincinnati plant, Griffin Wheel Co., succeeding L. LaVoie who was transferred to Detroit. Mr. Johnsen entered the employ of the Griffin Wheel Co. in 1909 as scale clerk at Chicago. In 1927 when the Cincinnati plant was built, he was appointed cashier in charge of that office. In that capacity he supervised the daily production schedules, material consumption, time and payroll distribution, and by contact with men in all departments, learned the details of operation. Mr. Johnsen's father and older brother both worked for the Griffin Wheel Co. and it is not surprising that he was interested in the making of car wheels. In the early days of the company, his father was considered one of the best wheel molders in the country and at the time of his death in 1929 had charge of the south cupola aisle in the molding room at Chicago.

♦ ♦ ♦

T. I. PHILLIPS recently has been appointed assistant to the president of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Mr. Phillips, formerly general works manager, will continue to be in charge of the headquarters manufacturing staff, the small motor, lighting and transformer divisions and construction department of the company, with headquarters in Pittsburgh.

♦ ♦ ♦

DR. TRACY C. JARRETT, formerly assistant metallurgist, American Optical Co., has been appointed chief metallurgist, American Hammered Piston Ring division, Koppers Co., Baltimore. Dr. Jarrett received his bachelor of science degree in metallurgy from South Dakota School of Mines in 1932; his master of science degree from Harvard Engineering School in 1933; and his degree as doctor of science in metallurgy from Harvard in 1936. During 1931 and 1932 he was a laboratory instructor in metallurgy at the South Dakota School of Mines and also was an instructor in metallurgy at Harvard as assistant to the late Prof. Albert Sauveur. Dr. Jarrett is a member of the American Society of Metals and of the American Institute for Mining and Metallurgical Engineers.

♦ ♦ ♦

L. C. WILSON, general manager of the Reading, Pratt & Cady division and Reading Steel Casting division of the American Chain & Cable Co. Inc., Reading, Pa., was awarded the Frederick A. Lorenz gold medal by the Steel Founders' Society of America at its annual meeting held in Chicago in February. Mr. Wilson is a graduate of the Sheffield Scientific School, Yale University. Following a number of years with the Harbison-Walker Refractories Co., Pittsburgh, in the sales department, Mr. Wilson joined the staff of the Chain Belt Co., Milwaukee, as assistant to the vice president, and he later became general sales manager. He became associated with the Federal Malleable Co. as secretary and later was elected vice president and general manager. In 1931 Mr. Wilson was appointed plant manager of the Reading Steel Casting Co., after having served as assistant plant manager of the American Chain company's York division at York, Pa. In June 1932 he was appointed general manager of the Reading Steel Casting Co. From 1926 to 1929 Mr. Wilson served as a director of the A. F. A., and is active in the work of various committees of that organization.

♦ ♦ ♦

THOMAS J. ROBERTS recently has been placed in charge of a new industrial department office which has been established by Johns-Manville Corp., New York, to facilitate service to the South. The new district, with headquarters at Atlanta, Ga., will serve the states of Georgia, Tennessee, North Carolina, South

(Continued on page 54)

I. M. Johnsen

T. I. Phillips

Dr. Tracy C. Jarrett

L. C. Wilson

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IN this grave period of national emergency there is no place—no time for delays in your foundry operations. That is why Woodward Iron Company is now keeping closer controls and checks on the quality of its merchant output than it ever has before. With all its furnaces completely air-conditioned for the better control of moisture in the air blast and all of its facilities now focused on the maintenance of uniformity in quality, our company is able to assert with confidence that Woodward iron will fully meet those standards of dependability which mean so much to you in these rush times.

WOODWARD IRON COMPANY

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America's Largest Completely Integrated and Entirely Independent Merchant Iron Producer

INDEPENDENT SINCE 1883

(*Continued from page 52*)

Carolina, Florida, Alabama, and Mississippi. Mr. Roberts is a graduate of Cornell University and has been with the power products and industrial department of Johns-Manville since 1925.

♦ ♦ ♦

VERNE E. MINICH, founder and until recently president, American Foundry Equipment Co., Mishawaka, Ind., and a prominent figure in the foundry industry for more than a quarter of a century, has been made chairman of the board of directors. OTTO A. PFAFF, formerly vice president and general manager, has been elected president, and general manager, and LESLIE L. ANDRUS, formerly sales manager, has been elevated to the office of vice president in charge of sales.

OTTO A. PFAFF was born in New York city and received his early education in the schools of Yonkers, N. Y., and later attended New York University where he specialized in economics, organization and management. In 1916 he became associated with the Sand Mixing Machine Co., New York, the forerunner of his present company. Mr. Pfaff has been connected with the American Foundry Equipment Co. during his entire industrial career. In 1920 he was made treasurer; in 1926, secretary and treasurer; in 1932, vice president and in 1935, vice president and general manager. He has been a director of the company since 1920. Mr. Pfaff is a director of the A. F. A. and is active in the work of the Foundry Equipment Manufacturers Association, is a member of the United States Chamber of Commerce, Industrial Manufacturers Association, National Association of Cost Accountants, and National Association for Management.

LESLIE L. ANDRUS was born in Columbus, O. and received his technical training at Purdue University. He was graduated in 1924 with a bachelor of science degree in mechanical engineering. Following graduation and prior to his connection with the American Foundry Equipment Co., Mr. Andrus was associated with the consulting engineering firm of Sargent & Lundy, Chicago, where his experience covered drafting, equipment purchases and field installation and operation. He was appointed general sales manager in charge of sales, service and advertising for the American Foundry Equipment Co. in 1937.

♦ ♦ ♦

THOMAS E. DUNN has resigned as a director and works manager, Bullard Co., Bridgeport, Conn., because of ill health. His position as works manager will be filled by FOSTER P. WHITWORTH. Mr. Dunn joined the company in 1917 and served successively as night superintendent, Bullard Engineering works, assistant production manager, Bullard Machine Tool Co.; production manager, assistant works manager and works manager. Mr. Dunn was instrumental in the development of the Bullard-Dunn electro-chemical descaling process.

♦ ♦ ♦

ORRIS BERGERUD recently was elected president, Fergus Iron Works Co., Fergus Falls, Minn.

♦ ♦ ♦

P. K. POVLSEN has been appointed assistant to the president, J. I. Case Co., Racine, Wis.

♦ ♦ ♦

JOHN W. MOCK has been named sales manager, Liquid Fuel Appliance division, Turner Brass Works, Sycamore, Ill.

♦ ♦ ♦

CHARLES T. RAMSDEN, associated with the Beloit Iron Works, Beloit, Wis., 45 years, the past 27 years as consulting engineer, has been elected a vice president.

♦ ♦ ♦

ELMER C. LUSK has joined Battelle Memorial Institute, Columbus, O. and is assisting with the various ore dressing and coal preparation investigations in progress at the Battelle laboratories. Mr. Lusk is a graduate of Muskingum College and formerly was associated with the Jeffrey Mfg. Co., Columbus.

♦ ♦ ♦

JOHN P. DUNPHY has been named general manager of Sager Lock Works division and Barrows Lock Works division, Yale & Towne Mfg. Co., North Chicago, Ill.

♦ ♦ ♦

WALTER S. PECKINPAUGH has joined the Skybryte Co., Cleveland, as sales representative for its line of maintenance paints and rust preventive products in that district.

♦ ♦ ♦

P. A. POUNDS recently has been appointed vice president and assistant general manager, Paxton-Mitchell Co., Omaha, Neb. E. B. CHRISTENSEN was appointed secretary and treasurer, and DAVID J. MILLER, sales manager.

♦ ♦ ♦

FAIRMAN B. LEE, 166 Jackson street, Seattle, has been appointed representative for the Ajax Electric Co. Inc., Philadelphia, in the Washington, Oregon, Northern Idaho and western Montana territory.

♦ ♦ ♦

B. STOCKFLETH has been appointed assistant to the president, Capt. C. S. McDowell, Enterprise Engine & Foundry Co., San Francisco. Mr. Stockfleth formerly had been connected with the Soule Steel Co., San Francisco; George S. May Co., and International Harvester Co., Chicago.

♦ ♦ ♦

HANS BOHUSLAV recently has been appointed vice president in charge of engineering, of the Enterprise Engine & Foundry Co., San Francisco. C. G. Cox has been appointed vice president in charge of sales, and C. M. SAYRE, vice president in charge of production.

♦ ♦ ♦

B. A. NAGELVOORT recently was elected president, Renown Stove Co., Owosso, Mich., to succeed J. E. ELLIS who resigned last November. Mr. Nagelvoort has been associated with the Renown company since Septem-

(*Continued on page 56*)

Verne E. Minich

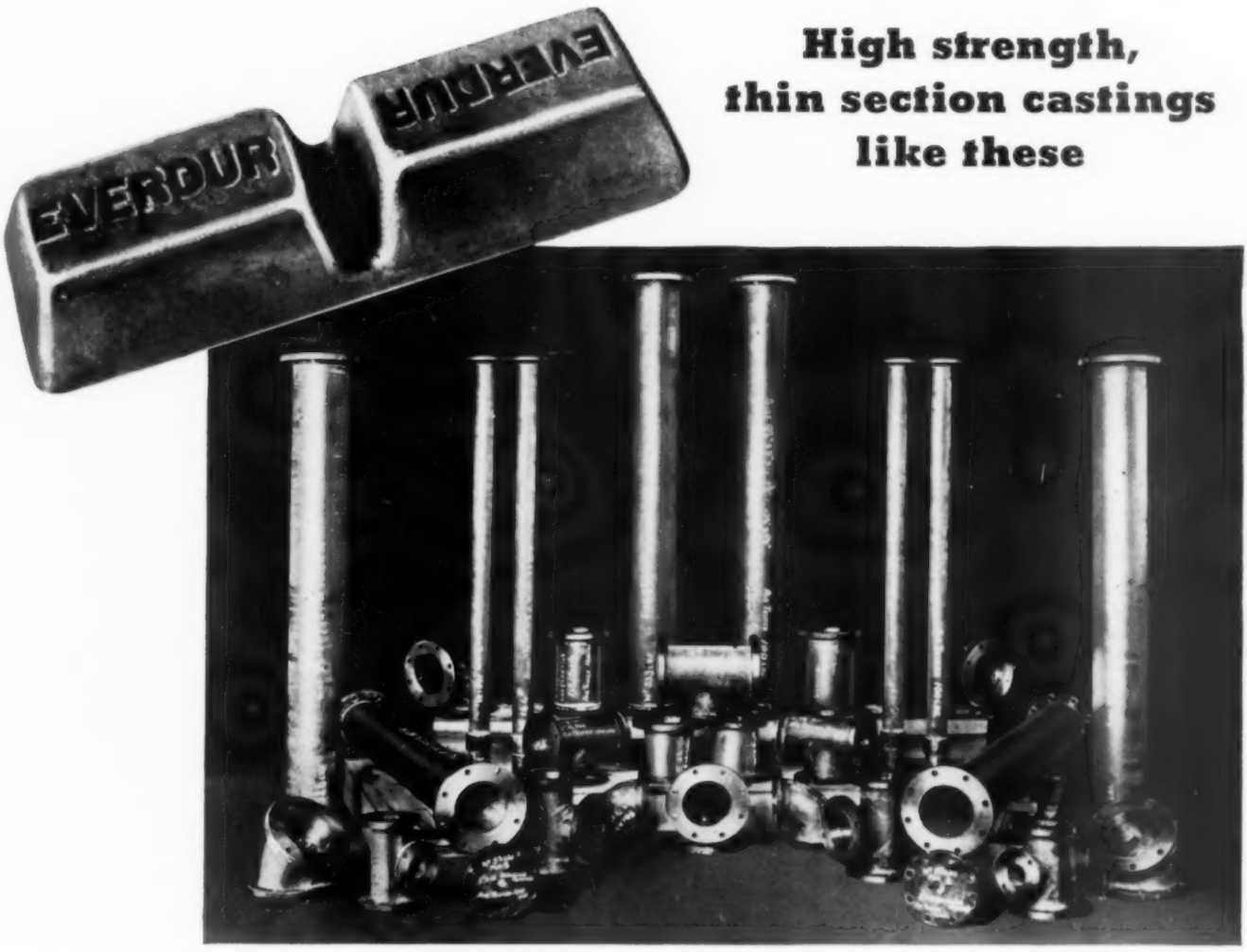
Otto A. Pfaff

Leslie L. Andrus

Thomas E. Dunn

From Everdur Copper-Silicon Alloy...

High strength, thin section castings like these



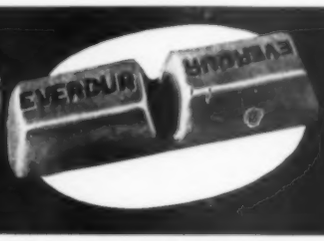
EVERDUR*, a development of metallurgical research in the field of engineering, has been successfully used over a fifteen-year period for the production of strong, sound castings. The advantages of this moderately priced copper-silicon alloy include excellent corrosion-resistance, good machining qualities, and general ease of handling in the foundry.

Everdur is furnished ready for use in 25-pound notched ingots and can be melted and cast by regular brass and bronze foundry equipment.

Be sure you're not missing a good bet. Find out about the excellent casting qualities of Everdur, and the physical properties of the castings you can produce with it. Anaconda Publication E-1 covers the subject completely. Simply write and ask us for a copy—no obligation whatsoever. 41162

ANACONDA

Everdur Casting Ingots



THE AMERICAN BRASS COMPANY, General Offices: Waterbury, Connecticut

In Canada: Anaconda American Brass Ltd., New Toronto, Ont. • Subsidiary of Anaconda Copper Mining Company

*EVERDUR IS A TRADEMARK OF THE AMERICAN BRASS COMPANY, REGISTERED IN THE UNITED STATES PATENT OFFICE

(*Continued from page* 54)

ber, 1932, and has served as secretary and treasurer since that date and as general manager since 1936. WALTER C. HOWE, formerly assistant treasurer, was elected secretary and treasurer; and FRANK W. RAYEN was appointed assistant treasurer.

♦ ♦ ♦

JAMES T. LEISK recently became associated with the Chicago Hardware Foundry Co., North Chicago, Ill., as chief metallurgist. Mr. Leisk graduated from Michigan State College of Mining and Technology with the degree of metallurgical engineer. After graduation he spent 3½ years in the metallurgical department of the Wisconsin Steel Co., an affiliate of the International Harvester Co., and for the past 2½ years has been metallurgist for the Western Foundry Co., Chicago.

♦ ♦ ♦

WILLIAM H. SEAMAN, vice president, Mesta Machine Co., West Homestead, Pa., recently resigned to become president, National Roll & Foundry Co., Avonmore, Pa. Mr. Seaman has been connected with the roll industry for many years, having started with Seaman-Sleeth Co., later Pittsburgh Rolls Corp. In 1924 he was appointed vice president, Hubbard Steel Foundry Co., Chicago, in charge of roll operations and when this company was taken over in 1930 to become part of Continental Roll & Steel Foundry Co., Mr. Seaman became vice president of that company. He joined Mesta in 1935 as vice president. D. H. SLONAKER, formerly president of National Roll & Foundry becomes chairman of the board. Other officers are: F. J. KAIB, vice president and treasurer, and A. J. BAIRD, vice president.

♦ ♦ ♦

JAMES M. WHITE has been appointed assistant general works manager, Allis-Chalmers Mfg. Co., Milwaukee. Mr. White was manager for the past 6 years of the company's La Porte works. He was born in River Falls, Ala., and was graduated from Alabama Polytechnical Institute with a degree in mechanical engineering. Throughout his high school and college years, he worked in manufacturing plants during summer vacations to gain practical knowledge and experience for his later work. In 1929 Mr. White joined Allis-Chalmers and entered its graduate student engineering course, serving his apprenticeship in the West Allis works. On completing this course he worked in various departments of the shop and in the field.

♦ ♦ ♦

T. P. SAMUELS, Ampco Metal Inc., Milwaukee, has been transferred to the Pacific coast territory. Mr. Samuels will work under the supervision of O. D. COOPER, and his headquarters will be at 918 North Clybourn avenue, Burbank, Calif.

♦ ♦ ♦

W. H. SPENCER, recently appointed works manager, Thomas Foundries Inc., Birmingham, Ala., formerly was foundry manager, Wilkening Mfg. Co., Philadelphia. Mr. Spencer was born in Thomasville, Ala., and received his early education in the schools of Alabama and Canada. His technical training was obtained at Vanderbilt university, Nashville, Tenn., where he received his bachelor of science degree in 1926. After graduation he joined the staff of the American Cast Iron Pipe Co., Birmingham, Ala., and with the exception of the year 1928-29 when he was foundry superintendent at the University of Illinois, Urbana, Ill., he was with the American Cast Iron Pipe Co. until 1934. At that time Mr. Spencer joined the Sealed Power Corp., Muskegon, Mich., as metallurgist; later becoming foundry superintendent and then technical director. He became associated with the Wilkening Mfg. Co. in 1939. Mr. Spencer is well known in the foundry industry for his many papers on different phases of cast iron and cupola practices, and his articles in the technical press. He is a member of the American Foundrymen's association and is active in many committees including the gray iron division of which he is general chairman.

♦ ♦ ♦

ALONZO M. HARP recently has been appointed assistant sales manager, DeBothezat Ventilating Equipment division, American Machine & Metals, Inc., East Moline, Ill. Mr. Harp has served in the manufacturing, engineering and sales departments of the DeBothezat organization since 1929, and for the past 3 years, has been sales manager of the central division. Mr. Harp will be located at the headquarter offices in East Moline, Ill.

♦ ♦ ♦

SIDNEY J. NEWMAN, president, Newman Bros. Inc., Cincinnati, recently was re-elected president for a third term, National Association of Ornamental Metal Manufacturers, at its annual convention in Cincinnati. HENRY J. NEILS, Flour City Ornamental Iron Works, Minneapolis, was re-elected president, National Association of Ornamental Nonferrous Manufacturers, and B. W. Stonebraker, Roanoke, Va., was re-elected president, Ornamental Iron Manufacturers. C. J. CONDON, Washington, was re-elected executive secretary of all three organizations, which are affiliated.

♦ ♦ ♦

JAMES S. DUNCAN, former vice president and general manager, Massey-Harris Ltd., Toronto, Ont., has been named president of that company, succeeding the late T. A. RUSSELL. W. K. HYSLOP, general manager, Massey-Harris Co., Racine, Wis., will assume the position of vice president, Massey-Harris Ltd., and also will continue as general manager of the Racine branch. E. G. BURGESS, formerly superintendent of factories, Massey-Harris Co., has been appointed assistant general manager and a member of the board of directors of the company. P. D.

(*Concluded on page* 58)

James T. Leisk

W. H. Spencer

William H. Seaman

James M. White

HOW TO GET A pat on the back FROM THE big boss

YOU SAY he isn't in the mood to pat anyone on the back, what with losing sleep nights worrying because the foundry's behind on deliveries?

THAT'S JUST THE POINT. You can get him in the mood by showing him how to save time and increase production by using Truline* Binder in cores.

Convenient-size Bag Is Easy to Handle

Fill out the coupon, pin it to your letterhead, and mail it *quick.* We'll see that you get a sample of Truline Binder, and information to help you to save time in baking and cleaning.

Maybe we are understating when we say a "pat on the back." You never can tell what the B. B. may do, for getting out more production, faster.

HOW TRULINE BINDER INCREASES PRODUCTION IN MANY FOUNDRIES

SAVES TIME ON BAKING Truline Binder bakes through quickly—increasing core oven output. Time saving is sometimes as much as 30%.

SAVES TIME ON CLEANING Cores collapse quickly; this makes cleaning faster. Some foundries have cut cleaning time 50% with Truline Binder.

SAVES TIME ON RAMMING Flowability of Truline Binder mix speeds ramming, particularly in green sand facings.

*Reg. U. S. Pat. Off., by Hercules Powder Co.

TRULINE BINDER
Reg. U. S. Pat. Off.
NAVAL STORES DEPARTMENT
HERCULES POWDER COMPANY
Incorporated
WILMINGTON, DELAWARE
CHICAGO NEW YORK ST. LOUIS SALT LAKE CITY SAN FRANCISCO

HERCULES POWDER COMPANY
999 Market Street, Wilmington, Delaware

Please send information about Truline Binder ☐
Please send a free trial sample ☐

Name .....
Company .....
Street .....
City ..... State .....

33-37

(*Concluded from page* 56)

CORKUM, master mechanic, has been chosen factory superintendent of the plant, and C. P. MILNE, assistant to the general manager of the Racine company, has been named a director.

♦ ♦ ♦

FREDERIC H. LEGGETT, treasurer and director, Western Electric Co., Chicago, will retire April 1 after 43 years service with the firm. GEORGE B. PROUD, assistant treasurer, was elected treasurer to succeed Mr. Leggett. Mr. Proud joined Western Electric Co. in 1909 as an accountant. He served as auditor in Chicago and New York, and later was made general auditor. In 1924 he was elected assistant treasurer, and in 1928 was appointed assistant comptroller. In 1941 Mr. Proud again was elected assistant treasurer. GUY W. VAUGHAN, Curtiss Wright Corp., was elected a director of Western Electric Co.

♦ ♦ ♦

CLARK C. WEETHEE, recently appointed superintendent, Tonawanda Foundry & Machine Co., Tonawanda, N. Y., formerly was foundry superintendent, Massey-Harris Co., Batavia, N. Y. He was born in Athens, O., and started his foundry career at Zanesville, O., as coremaker and molder. In 1915 Mr. Weethee became connected with the American Malleable Co., Owosso, Mich., as core foreman. He then served as foundry foreman and in 1926 was appointed plant superintendent. In 1934 he joined the General Foundry & Machine Co., Flint, Mich., and in 1937 became associated with the Massey-Harris Co.

♦ ♦ ♦

J. C. MERWIN, vice president since 1924 and treasurer since 1939, Chain Belt Co., Milwaukee, recently was elected president, succeeding the late C. R. MESSINGER. G. M. DYKE, assistant treasurer, was named treasurer, and A. F. KESSLER, also an assistant treasurer, was elected comptroller, a new office.

Mr. Merwin joined the Chain Belt company in 1917 and was successively superintendent, works manager and assistant to the president. In 1923, he was elected a director and became vice president in 1924. Late in 1939, he was elected treasurer and has served as vice president and treasurer since that time. He graduated from Sheffield Scientific school of Yale university, New Haven, Conn., in 1910.

Mr. Dyke became affiliated with the company in 1923. Mr. Kessler joined it also in 1923 and was chief accountant until 1938 when he was made assistant treasurer.

♦ ♦ ♦

A number of changes have been made in the sales department of the Norton Co., Worcester, Mass. R. O. ANDERSON, formerly district manager in Pittsburgh, has been transferred to Worcester; C. B. PRICE has been made district manager at Pittsburgh, being transferred from the Southeast section; LORIN W. GRUBBS, who has been assisting Mr. Price in the eastern part of that section will continue to serve that area with ZACHARY M. ALMAND, from sales engineering department at Worcester, taking over the western part of the territory; G. T. TAYLOR has been transferred from New York city to the Chicago district; J. S. ANDERSON, formerly at Pittsburgh now is at New York; W. A. RUSSELL, field engineer in Pittsburgh, will take over Mr. Anderson's Pittsburgh territory; J. L. TOBEY of the sales engineering department at Worcester has been appointed field engineer at Pittsburgh; J. E. STRACHAN JR., recently field engineer in New England, has been assigned as a salesman in southern Ohio.

A.F.A. Medal Awards

Board of Awards of the American Foundrymen's association has recommended gold medal awards to four men who have made outstanding contributions to the advancement of the foundry industry. Presentation of the medals will take place at the annual convention to be held in New York during the week of May 12. The awards are as follow:

Charles Edgar Hoyt, executive vice president and manager of exhibits of the A.F.A., the Joseph S. Seaman medal, for his exceptionally outstanding service to the foundry industry as manager of foundry exhibits since 1908, as secretary and treasurer of the association from 1918 through 1936, and as executive vice president since 1936.

Donald J. Reese, engineer, Research & Development division, International Nickel Co. Inc., New York, the J. H. Whiting medal for his outstanding contributions to the foundry industry and the A.F.A. through his work in improvement of cupola melting methods.

Max Kuniansky, general manager, Lynchburg Foundry Co., Lynchburg, Va., the W. H. McFadden medal, for outstanding contributions to the gray iron industry and to the association.

Fred L. Wolf, technical director, Ohio Brass Co., Mansfield, O., the John A. Penton medal, for his outstanding contributions to the nonferrous and malleable castings industry and the association.

In addition to the medal awards, the A.F.A. will recognize the long continued service and early pioneering work in the technical development of the industry carried on by Henry M. Lane, Grosse Isle, Mich., by making him an honorary life member of the association.

Board of Awards was comprised of Henry S. Washburn, Plainville Casting Co., Plainville, Conn., chairman; Marshall Post, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.; Hyman Bornstein, Deere & Co., Moline, Ill.; James L. Wick Jr., Falcon Bronze Co., Youngstown, O; D. M. Avey, Tulsa, Okla.; Frank J. Lanahan, Fort Pitt Malleable Iron Co., Pittsburgh, and T. S. Hammond, Whiting Corp., Harvey, Ill.

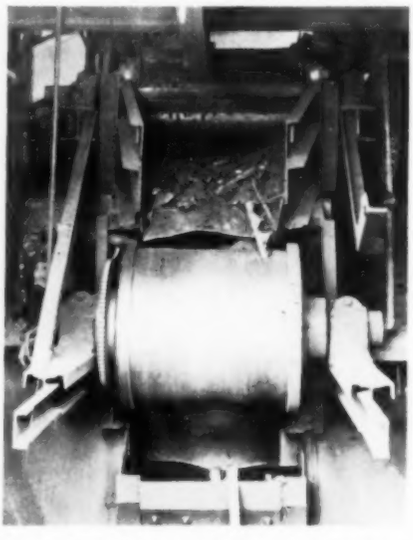
Castings Production

Production of steel castings in 1940, according to a recent survey of the bureau of census, department of commerce, was 797,947 short tons, as compared with 594,147 tons in 1939, and 342,737 in 1938. The 1940 tonnage was divided into 290,255 tons of railway specialties and 507,692 tons of miscellaneous steel castings. The report indicates that the average operation of the industry for 1940 was 56.8 per cent, although the December figure was 73.3 per cent of capacity.

To Hold Meeting

The Porcelain Enamel Institute, Chicago, will hold its tenth annual meeting at French Lick Spring hotel, French Lick, Ind., on April 17 and 18. Speakers at the meeting will include Colonel Murphy, procurement planning officer, Quartermaster Depot, and Miss Frances Weedman, consulting home economist, Chicago.

SPO, Inc. has moved from Waterman avenue and East Sixty-first street, Cleveland, to 7500 Grand Division avenue, Cleveland.



In an automobile sand reconditioning plant a special drum designed and built by the Stearns Magnetic Mfg. Co., Milwaukee, serves satisfactorily where sand and scrap are too hot to be handled on rubber belts

"FERROCARBO"

(the silicon carbide reducing agent)

USED HERE

GIVES MACHINABILITY, HIGH FINISH...

•IN THE MACHINE SHOP... High Machining Speeds... Excellent Finish... Longer Tool Life... Less Machine Scrap... Freedom from Hard Spots

•IN THE FOUNDRY... Hot, Fluid Iron... Economical Charge ... Less Discount... Dense, Fine Grained Iron... Reduced Chill

AND LOW COST OF FINISHED CASTINGS

•IN FINISHED CASTINGS... Strength... Toughness—High Impact Resistance... Wear Resistance ... Uniformity... Low Cost

Don't Delay a Trial Order!

REFRACTORY CARBORUNDUM PRODUCTS

THE CARBORUNDUM COMPANY

REG. U. S. PAT. OFF.

Refractory Division, PERTH AMBOY, N. J.

District Sales Branches: Chicago, Philadelphia, Detroit, Cleveland, Boston, Pittsburgh. Distributors: McConnell Sales and Engineering Corporation, Birmingham, Ala.; Christy Firebrick Company, St. Louis, Mo.; Harrison & Company, Salt Lake City, Utah; Pacific Abrasive Supply Company, Los Angeles, San Francisco, Calif.; Denver Fire Clay Co., El Paso, Texas; Smith-Sharpe Company, Minneapolis, Minn.

Distributed by Kerchner, Marshall & Co., Pittsburgh and Cleveland; Miller & Company, Chicago, St. Louis and Cincinnati.

(Carborundum and Ferrocarbo are registered trade-marks of and indicate manufacture by The Carborundum Company)

THE ADVENTURES OF BILL

By PAT DWYER

Drawings By RICHEY

I HAD a letter the other day," said Bill, "from a man who took a notion several years ago to quit the foundry and become a kind of hermit farmer. He got a piece of land away out here back of the town some place and settled down there with a cow and a pig and a few chickens. I never heard all the details of his story, but it was rumored around that his wife was quite a walker. One day she walked out and disappeared and left him with a couple of very small children. He could have ditched them or placed them in an institution, but he was one of these unfortunate creatures with a conscience, a sense of responsibility, and a nicely developed appreciation of right and wrong. He cut all existing ties, retired to the little farm and soon was forgotten by all the old neighbors and friends. I shall not be surprised to learn that the present letter is the first he has written since he crawled into the hermit's cave and pulled the door in behind him. He is just beginning to find out that a man with a couple of lively daughters might just as well quit the hermit business and get back in circulation again."

"And pray," I inquired coldly, "what possible interest has all this rigmarole for me? I have lived a reasonably long life without any knowledge of this hide and go seek friend of your's. Is it not reasonable to assume that I shall finish out the allotted span perfectly happy and contented if I never hear anything further about him? He is not the first or only man whose wife did the disappearing act. He is lucky she did not wing him with the family gun or do a little fancy carving with the butcher knife before she left. After so many years living like a woodchuck in a hole he comes out and starts writing letters. The best advice you can give him is to creep back in the hole and keep his eyes and ears tightly closed."

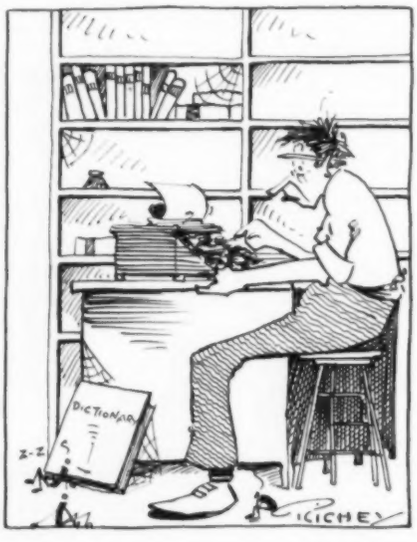
"If I have warned you once, I have pointed out to you one hundred and seventy-five times that this unfortunate habit of jumping to conclusions will land you in the dog house. You are so close to little Towser's front door now that if he rattles his chain you will fall in. Listen, my young friend. I merely sketched in a few facts to form a kind of a background. Lead up to a subject gradual, is what I always say. Since you are—by a charitable stretching of the imagination—a bit of a literary gent, I had intended to ask your opinion on a certain inquiry in the letter."

"Why don't you take care of the inquiry yourself?"

"Because, little Bright Eyes, I do not know the answer. If you know a better reason than that I shall be delighted to learn what it is. I know the temptation to answer letters is too strong for many people, but I am kind of funny that way. There are so many things in the limitless field of knowledge that I am not in the least embarrassed to admit I do not know the answer to something outside my limited scope. Why should I? No man knows it all and outside of specialized lines the smartest knows very little."

"Very neat indeed," I admitted graciously. "What is this little nubbin of knowledge on which you suspect I may have cut the old wisdom teeth?"

"Well," said Bill, "I'll tell you. This bird did not read a paper or a magazine for several years. Now he picks one up and finds that the author of a story had adopted a method of spelling that leaves him—the innocent reader—up a tree. He wonders if he will have to learn to read all over again. Personally, I would not know. I leaf through a magazine now and again and look at the pictures, but I do not waste any time reading the drivelly stories about characters who are either crooks or morons. Now on the other hand as you might say, you have your nose stuck in a book or magazine nearly all the time, therefore you probably know the answer to this problem propounded by little Willie Woodchuck from his home among the roots of the spreading chestnut tree. Listen. I'll read you the letter written on a ruled page from an ancient school scribbler. I shall skip the date, address, rural route so and so and all that kind of stuff. You do not care where he lives. Or do you?"



Author seems to have struck a knot

Resting my right elbow firmly on the chair arm I raised my open right hand twice and let it fall.

"Go ahead, hey? I shall have to get you a red lantern for night work. All set? Le's go."

DEAR FRIEND:

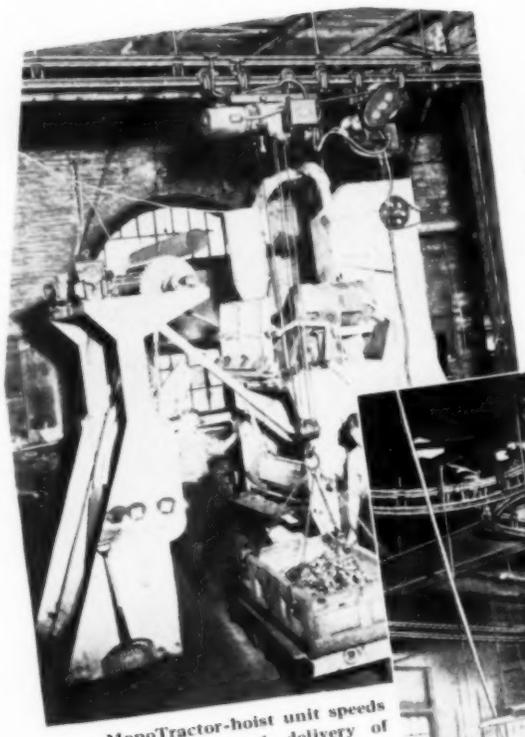
Living out here kind of in the woods has its advantages and then again on the other hand it has its disadvantages. The kids are beginning to grow up. Elviry, the older of the two will be 14 the 14th of May. An odd kind of a coincidence, hey? She is as smart as a whip. I was thinking lately it is about time she learned to read and write, so I fetched some of my old books down from the hay mow and I want to tell you we have some real interesting sessions. Of course she never may have any use for the knowledge, but then again on the other hand it won't do her no harm. Kind of a genteel accomplishment like playing the piano or crocheting—or is it croshaying—I always trip over that one—croshaying antimacassars. We ain't got no piano and never expect to have one and we ain't got no parlor nor no parlor furniture on which to spread these here now antimacassars even if we had 'em.

Little Philomena is only 7 and as

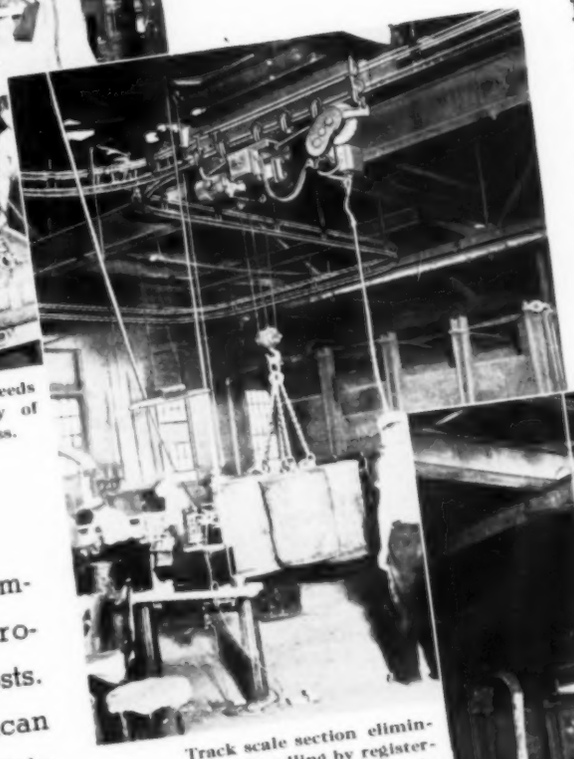
(*Continued on page 62*)

MECHANIZE your simple jobs!

Power operation will speed up your production and cut down handling costs.



MonoTractor-hoist unit speeds up removal and delivery of castings to cleaning process.



Track scale section eliminates rehandling by registering weight of castings in transit.

Heavy loads are easily and quickly moved by power operated equipment.

It's the time-consuming, simple jobs that tie up production and pile up costs. Hence, when an American MonoTractor with electric hoist takes over the handling operations, bottlenecks disappear, materials move smoothly between process and costs inevitably fall.

With their specialized experience, American MonoRail engineers are often able to discover hidden possibilities for the application of simple handling systems that bring an immediate return from a small investment. This service is available from district offices located in every industrial center.

How Problems are Solved!

Write for copy of this "Blue Book" containing hundreds of illustrations showing solutions to a wide variety of handling problems.

THE AMERICAN MONORAIL CO.

13104 ATHENS AVENUE, CLEVELAND, OHIO

ADVERTISING PAGES REMOVED

(*Continued from page* 60)

clever as they make 'em. She can sidle up to the old muley cow, the kicker and get away with a full pail. And if you don't think that is something to write home about, you should try it once. The way she can swoosh the swill into the pig trough is a caution. She has got so now she can pick out nearly all the pictures in a Burdock Blood Bitters almanac I got one time I was in town when Hoover or Coolidge or some person was running for the job of president. I often have wondered how that election came out. When and if you write you might tell me who is Number One man in Washington this year.

There was a young fellow came by here in an old Ford the other day. He wasn't selling nothing, but gradually he admitted that he was like them there old knight fellows in the olden times who used to go around to tournaments, you know, kind of free for all fights where the boys whanged you know what out of each other's armor with swords and battle axes. The field of honor must have been as noisy as a modern boiler shop or a ship yard with a flock of riveting guns on the job.

The young lad was working his way through college. Some day he would be a doctor and devote all his time to relieving the woes, the trials and tribulations of suffering humanity. Most of his work would be donated freely and his reward would come in the gratitude of his patients and the realization that he was an humble instrument in their recovery.

He explained that the tournament thing was figured up in points and if a fellow got 500 or 1000 or something, why, he got a prize of $500. Purty nice money, any way you look at it. More than I make in a year. Finally he admitted that he had a few magazines in the car. He hated the idea of bothering us to look them over, but on the other hand he felt we were all friends together and it might be interesting to kind of leaf through them. If we wanted to subscribe for one or two or half a dozen, why, he would be glad to take the name. 'Twas all the same to him whether we did or not, but of course he could not forget that at the tournament he would get 100 or 200 points for every name on his list. Well, anyway I signed up for one of the magazines. When the first issue arrived I looked through it and then read one of the stories. For no reason that I could see the author crippled the English language all the way through. Here are a few samples:

He'd been down with Helen * * * Since the city desk'd thought of this way * * * who'd helped the men along * * * Before the party'd walked a block * * * dampened by what their father'd said * * * guessed they'd laugh * * * last thing a Four Tiger man'd do * * * the apothecary must've pleaded * * * of course it'd be * * * she'd be saying * * * Helen'd once liked a reporter * * * he could've seized the stolen funds * * * John's father'd told him * * * even if there'd been five men * * * there'd be no charge * * * as to what they'd see * * * hate Chinese who're better off * * * sort of fellow who'd rob a relief fund * * * if the actor'd done the killing * * * Helen'd called this ridiculous * * * the girl who'd bewitched her husband * * * the hero'd killed because he kept clinging * * * maybe there's a moral to it * * * see how a fan's held over the actor's head * * * and it would've been equally unlucky * * * John'd wanted to manage alone * * * he could've been at a window * * * his own party'd think * * * what minor crimes they'd expected to take part in.

"My correspondent," Bill said, "wants to know if that is modern English, or double talk or just silly affectation."

"Did you ever hear of the guessing game played by the little old, old, old lady and the little boy who was half past three? The boy with the twisted knee?"

"Can't say as I have. What about 'em?"

"The little boy hit it with his three!"

"I guess you're right. No. 3 rings the bell. Here is another inquiry in plain foundry English from a lad who takes his pen in hand and writes that he wishes I would sit down, leave out all the tripe and ornamental trimmings and tell him in my own homely way how I would go about making a good machineable bronze that will stand the gaff and sell at a reasonable figure, say about 30 cents per pound. What do you think, says he, of scrap in comparison with ingot metal. Also do I think these ingot dealers are honest and responsible. He had heard that the dealers juggle the material among themselves and extract all the copper, tin, lead and zinc before they sell it to the customers. In his district he can pick up all the scrap he wants. Some is excellent material, but some of the stuff is rotten and filled with blow holes. In making up the well known bearing mixture 80-10-10 how is one to handle the ingredients to anticipate the loss of lead and tin and to be sure that a sample will show definite analysis and specifications.

"I told him," said Bill, "that I have seen little brass foundries that never had an ingot in 'em since the day they were built. However, in each case the old man invariably had a species of sixth sense that enabled him to select just the right stuff when rooting around in the scrap pile. That is something in the line of knowledge that can't be picked up over night. An expert melter can charge a pot or a furnace from a scrap bin, but a man who is not familiar with the subject probably will produce a metal that is not suitable for a given purpose. The analysis always is supplied with every shipment of ingot metal. A man not necessarily an expert melter can make up a heat of ingot metal and—barring hazards in melting, molding and pouring—the castings will conform to the required

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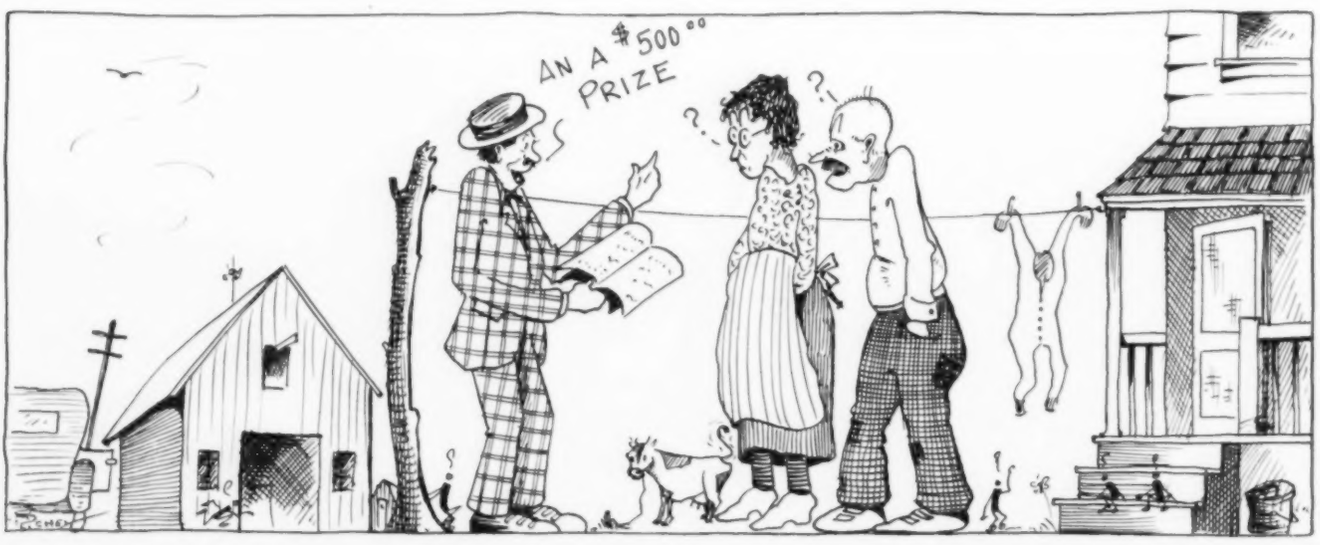


The old gimme, gimme line widely practiced in the political field to elect incompetents to high offices and high salaries

Birmingham HOLDS NINTH ANNUAL CONFERENCE

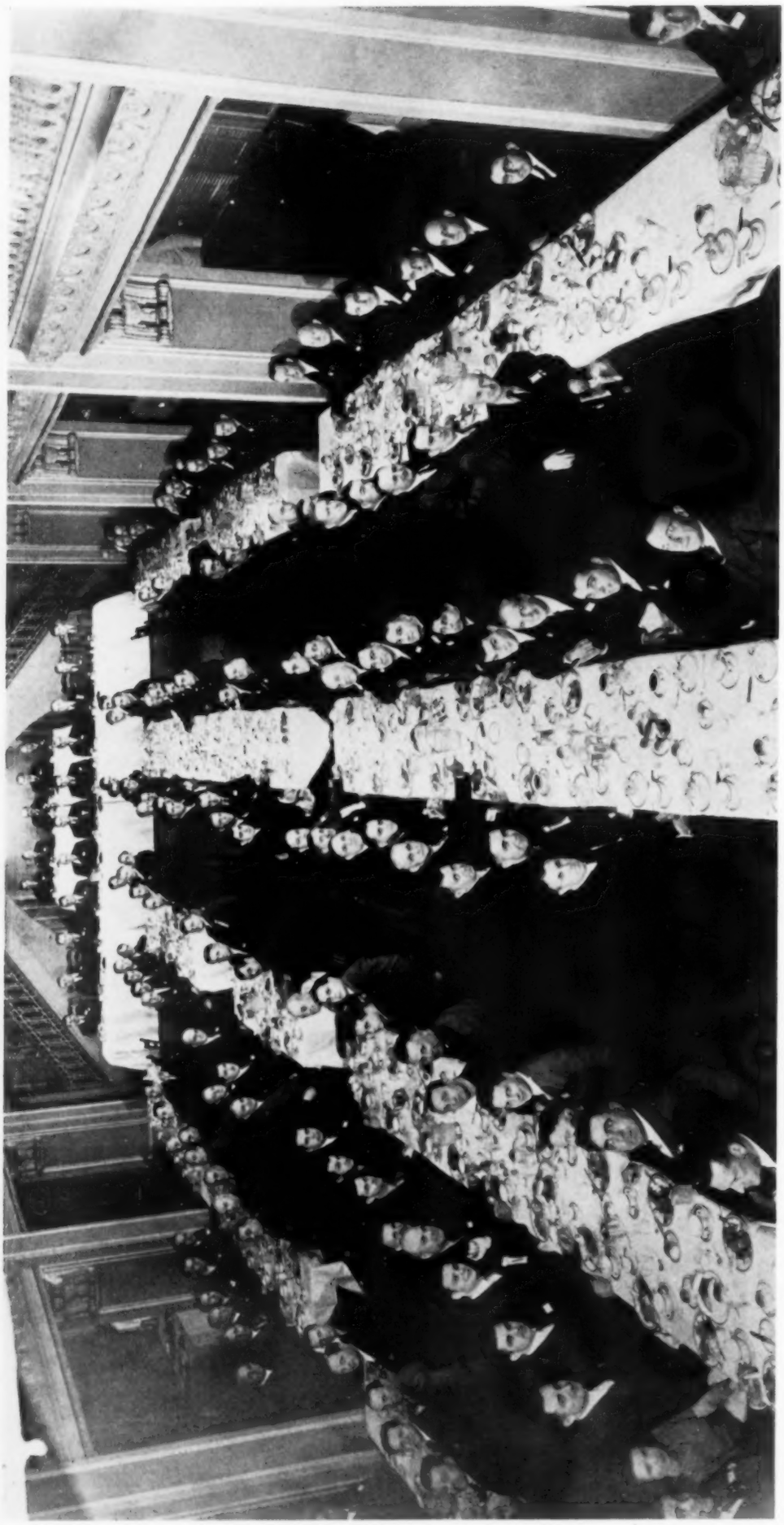
President Lester N. Shannon, Birmingham, and Executive Vice President C. E. Hoyt, Chicago. Photo by William W. McCulloch, American Cast Iron Pipe Co., Birmingham

THE ninth annual foundry practice conference sponsored by the Birmingham District Chapter of the A. F. A. and held on Feb. 27 and 28 in Birmingham, Ala., was one of the most successful ever arranged. In spite of the increased activity in the foundries of the district which kept many away, the attendance was over 500. All sessions were held at the Tutwiler hotel. High spot of the meeting was the annual banquet held on Friday evening with W. O. McMahon, Sloss-Sheffield Steel & Iron Co., and chairman of the chapter, presiding. Warren E. Whitney, National Cast Iron Pipe division, Jas. B. Clow & Sons, Birmingham, was toastmaster and the principal speaker was Robert C. Hendon, administrative assistant, Federal Bureau of Investigation, Washington, who talked on "Preparedness and the F. B. I." Honored guests at the speakers' table included Lester N. Shannon, Birmingham, national president of the AFA.; C.E. Hoyt, Chicago executive vice president of the association, and Robert E. Kennedy, Chicago, secretary of the national organization.

Opening technical session was held on Thursday morning, Feb. 27 under Chairman W. H. Spencer, Thomas Foundries Inc., Birmingham, and the speaker was Dr. J. T. MacKenzie, American Cast Iron Pipe Co., Birmingham, who discussed "Engineering Properties of Cast Iron." He pointed out that the total amount of carbon, its distribution as combined carbon and free or graphitic carbon, and the arrangement and size of the latter and are extremely important in determining the physical and mechanical properties of cast iron. Since those factors can be controlled to a considerable degree it is possible to produce a wide range of cast irons to meet various requirements. Dr. MacKenzie used numerous slides to illustrate his talk including tables and graphs which gave data on tensile, transverse, and compressive strengths, modulus of elasticity, impact strength, fatigue resistance, effect of alloys, etc.

In the discussion which followed a question was asked on the minimum time required to anneal chilled cast iron containing about 2.50 per cent silicon. The reply was about 15 to 30 minutes at a temperature of 1750 degrees Fahr. with slow cooling through the critical range. With lower silicon or lower temperature, more time would be required. In answer to a question on relation-

Left—Warren E. Whitney, National Cast Iron Pipe Co., Birmingham, and Robert C. Hendon, Federal Bureau of Investigation, Washington. Right—Reading from left to right, W. O. McMahon, Sloss-Sheffield Steel & Iron Co., and chairman of the Birmingham District Chapter; James A. Bowers, American Cast Iron Pipe Co., and vice chairman of the chapter, and D. L. Booker, National Cast Iron Pipe Co., and secretary-treasurer of the Birmingham Chapter. Photos courtesy William W. McCullough, American Cast Iron Pipe Co.



A partial view of those attending the luncheon on Thursday noon

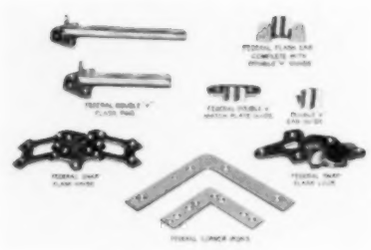
ships between various properties, it was pointed out that with a normal cast iron, the compressive strength varies directly with brinell hardness, and that the compressive strength is from three to five times the value for tensile strength. Also machinability varies with brinell hardness in normal irons, but that condition is not true with other types of cast iron. Dr. MacKenzie stated that in compression the graphite acts as a solid while in tension it acts like a void. However, in fatigue tests with alternate bending the graphite has a different effect than voids in specimens formed from powdered cast iron. In response to a question on the effect of the dendritic graphite pattern on corrosion resistance the speaker said that it was not nearly so good as the regular or normal type pattern.

At the luncheon held Thursday noon J. A. Bowers, American Cast Iron Pipe Co., Birmingham, and vice chairman of the chapter, presided. He introduced the Hon. W. Cooper Green, president of the Birmingham City commission who welcomed those attending the conference to the city. Robert E. Kennedy, secretary of the A. F. A. was the principal speaker at the luncheon, and he gave a very interesting talk on "The Association's Place in the Foundry Industry."

Second technical session was held at 2:30 p.m. with W. E. Jones, Stockham Pipe Fittings Co., Birmingham, in the chair. He introduced Garnett P. Phillips, automotive division, International Harvester Co., Chicago, who talked on "Cast Iron in the Automotive Foundry." Mr. Phillips stated that in general the application involves three broad groups of problems of strength, heat and oxidation, and wear. Inherent physical properties of the iron should be known to the engineering department, and after experimental machines are built and tested, changes may be necessary due to unusual stresses not foreseen by the designers.

Changes that may be made are design, material and heat treatment. Mr. Phillips gave data on a number of compositions employed for various types of castings. One for the main frame of a large tractor which weighed 2465 pounds and has sections ranging from $\frac{5}{8}$ to 1-inch contains 2.05 to 2.30 per cent silicon, 3.25 to 3.50 per cent total carbon, 0.12 per cent maximum sulphur, 0.25 per cent maximum phosphorus, 0.50 to 0.75 per cent manganese, 0.15 to

(*Continued on page* 68)



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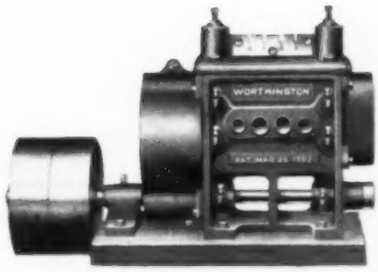

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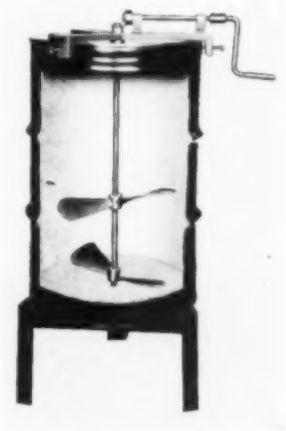

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ADVERTISING PAGES REMOVED

(*Continued from page* 66)

0.30 per cent nickel, and 0.25 to 0.40 per cent chromium. The casting is subjected to severe stresses including shock and some torsion. Brinell hardness number of the casting ranges from 170 to 210 and the transverse load on a 1.20-inch bar on 12-inch centers shows 3500 to 4000 pounds with a deflection of 0.10-inch minimum.

Cylinder heads for diesel engines and heavy duty gasoline engines are heat treated at 1000 to 1050 degrees Fahr. for 2 hours and furnace cooled to 500 degrees. The composition shows 2.10 to 2.30 per cent silicon, 3.30 to 3.55 per cent total carbon, 0.12 per cent maximum sulphur, 0.25 per cent maximum phosphorus, 0.50 to 0.75 per cent manganese, 1.00 to 1.50 per cent copper, 0.50 to 0.75 per cent chromium and 0.15 to 0.30 per cent nickel. For hardened iron parts, oil quenched and drawn, the following analysis is used: Silicon 2.05 to 2.25 per cent; carbon 3.25 to 3.50 per cent; sulphur 0.12 per cent maximum; phosphorus 0.25 per cent maximum; manganese 0.55 to 0.80 per cent; copper 1.00 to 1.50 per cent; chromium 0.60 to 0.85 per cent, and nickel 0.10 to 0.25 per cent. Optimum hardness and strength are obtained by drawing at 450 degrees Fahr.

Replying to a question on whether all holes in a cylinder block shown in one of the slides were cored, and if trouble was found in drilling and reaming those, the speaker stated that the holes were cored, and no particular difficulty was found in machining. In response to an inquiry on why the phosphorus was held to a maximum of 0.25 per cent especially on certain thin section castings such as manifolds, Mr. Phillips stated that there were several reasons including that of single base iron which could be varied simply by additions to silicon and alloys to meet the several requirements, desirability in intricate castings to reduce shrinkage to a minimum, and the necessity of preventing porosity in heavy bosses adjacent to thin sections.

Third and concluding technical session on Thursday was held at 4 o'clock under the direction of Prof. Ray L. Farabee, University of Alabama, University, Ala. Subject of the session was "Some Considerations Regarding Carbon in Cast Iron" which was discussed by Dr. C. H. Lorig, Battelle Memorial Institute, Columbus, O. He said that the influence of carbon predominates over all other constituents in cast iron in determining its physical and engineering properties. The relative proportions of graphite and combined carbon exert a powerful influence, and in addition the structural state of the graphite is exceedingly important so that any simple relationship between carbon content and properties of cast iron is not possible.

Showed Data on Three Irons

Structural state of the graphite is influenced profoundly by the melting and thermal histories so that it is possible to obtain great differences in mechanical properties from irons of substantially the same chemical composition. To illustrate the point Dr. Lorig showed data on three cast irons containing about 3.00 per cent total carbon, 2.20 per cent silicon, 0.72 per cent manganese, 0.06 per cent sulphur and 0.10 per cent phosphorus which were melted in a high frequency furnace. One iron *A* was made with all materials placed in the furnace, heated to 2850 degrees Fahr. before placing in the ladle, and allowed to cool to 2550 degrees for casting. With the others *B* and *C* 0.50 per cent of the silicon was withheld from the furnace, and added as ferrosilicon in the ladle. However, in one case the iron *B* was heated to only 2450 degrees before adding the ferrosilicon while in the other the iron *C* was heated to 3150 degrees before adding silicon, and cast at 2550 degrees.

Iron *A* showed a tensile strength of 31,000 pounds per square inch, a transverse strength of 2355 pounds, a deflection of 0.21-inch, a brinell hardness of 186 and a chill depth of 0.500-inch. Iron *B* had a tensile strength of 39,500 pounds per square inch, transverse strength of 2920 pounds, deflection of 0.39-inch, brinell hardness of 189, and a chill of 0.062-inch. Iron *C* showed a tensile strength of 51,000 pounds per square inch, transverse strength of 3045 pounds, deflection of 0.38-inch, brinell hardness of 208, and chill depth of 0.187-inch.

Dr. Lorig then described the distribution of carbon in the microstructure of cast iron based on an idealized constitutional or equilibrium diagram with a constant silicon content of 2 per cent. He stated that while the diagram indicated the mechanism, the relative quantities of graphite and combined carbon, and the size of the graphite could not be predetermined exactly due to certain factors. Those include the rate of cooling which is the strongest, previous thermal history, and silicon content. Therefore, due to those and other influences graphite may occur in unheat-treated irons as kish formed during the freezing of hyper-eutectic iron, as a flake of variable size formed directly during freezing of the eutectic mixture for both hypo- and hyper-eutectic irons, or as tiny particles resulting from the decomposition of carbide shortly after it is formed.

Some carbide may remain undecomposed in the chill and also throughout the matrix of the iron. While the combined carbon in the matrix influences the mechanical properties of the iron to some extent, it is the amount, the size and the distribution of graphite which controls the quality of the iron for the most part. While different forms of graphite may be produced through superheating, ladle inoculation, changes of cooling rate and

(*Concluded on page* 71)

A few informal shots taken during the ninth annual conference at Birmingham. Photos courtesy William W. McCulloch, American Cast Iron Pipe Co., Birmingham

(*Concluded from page 68*)

different melting equipment, the gray iron industry is not yet ready to produce at will any type of structure or any predetermined set of properties in cast iron. However, some of those are used to minimize the sharp fluctuations in structures and properties encountered when control is less rigid.

In the discussion which followed Dr. Lorig's presentation a question was asked on the effect of ladle additions other than silicon, such as graphite, proprietary materials, etc., and he replied that while he had not had personal experience with all of them, that in general they, like late additions of silicon, gave an improved product. The speaker also said that he was unable to explain why improvement occurred since it was rather difficult to determine the reasons. Possibly it might lie in the coalescence or elimination of fine inclusions, but as yet there was no certain procedure of identifying those.

On Thursday evening more than 400 attended the entertainment provided by the Birmingham chapter under the direction of Joe T. Gilbert. Stockham Pipe Fittings Co. Feature of the program was the presentation of colored motion pictures of the Sugar-bowl football game held in New Orleans between Tennessee and Boston college. Entire morning of Friday, Feb. 28 was devoted to the plant visitation program which included some 20 or 30 of the leading foundries in the Birmingham district and was arranged by Co-chairmen A. S. Holberg, Alabama Clay Products Co., and H. G. Mouat, Whiting Corp., Birmingham.

Training Foremen In New Problem

First technical session on Friday was held at 2 p.m. with R. H. Mattison, McWane Cast Iron Pipe Co., Birmingham in the chair. He introduced Leslie E. Sanders, National Foreman's Institute Inc., Deep River, Conn. who spoke on the "Place of the Foreman in National Defense." He stated that there is no single new problem or factor developed by the program of national defense for which the foreman must be trained to meet. The only difference is that human behavior under stress develops more problems for the administrators of human beings than it does under normal conditions. Also that the problem of training foremen rests with industry itself.

Foremen should be instructed in ability to train new workers, and to train further and to advance experienced men now under their direction. In addition to being a training officer the foreman must possess knowledge of the worker, what he wants and expects; act as the liaison officer between worker and management; be able to inform the worker; give orders that are carried out; maintain discipline; sustain accord between workers; plan the working day in his department; maintain harmony in contacts with organized labor; be watchful in matters of possible sabotage, etc.

In response to a question from the floor on whether it was necessary to have specially trained men to give the required instruction in individual plants or whether such work could be done co-operatively by two plants, Mr. Sanders said he believed that much more could be accomplished in individual plant training. The men selected to do the training must be quite competent, and an important requisite is that they have the respect of the foremen to be trained.

According to Mr. Sanders there are several different procedures in training foremen and they include correspondence courses, holding of meetings and informal conferences, and holding lecture courses at which experts speak. He stated that a number of firms including his own were engaged in foreman training instruction, and information relative to them could be secured easily.

Discuss Copper Additions

Final technical session was held Friday afternoon at 3:30 p.m. Charles K. Donoho, American Cast Iron Pipe Co., Birmingham, presided. J. E. Jackson, Copper Iron & Steel Development Association, Cleveland, spoke on "A Resume—Copper in Iron and Steel." In opening his discussion the speaker touched upon the use of copper in wrought, corrosion resisting steels. The amount used is about 0.25 per cent. While some copper had been used in castings prior to 1933, attention was focused on its application by publicity of one of the large automobile producers, and at present copper is an alloying element in a wide variety of ferrous castings.

While in some applications copper is the only alloying agent, it generally is employed in combination with other elements such as chromium, molybdenum, nickel and vanadium. The amount used may be from 0.50 to 3.00 per cent. In cast steels, Mr. Jackson said, copper increases the strength, and makes them susceptible to precipitation hardening. In normal malleable and pearlitic malleable cast irons copper increases corrosion resistance, increases tensile and yield strengths, and reduces graphite nodule size. Possibly it also may reduce annealing time.

In cast iron, according to Mr. Jackson, copper serves a two-fold purpose of beneficial effect on quality of molten iron through better fluidity and improved castability, and improvement in engineering properties. He illustrated his talk with numerous slides containing tables and graphs showing data confirming his statements. In closing he described how copper is added to the metal. When added to the furnace charge it may be as refined copper ingot, copper-bearing steel or cast iron scrap, copper-bearing silvery pig iron, or as pure copper scrap. For ladle or spout additions the copper may be sheared pieces of refined blister copper, copper shot, scrap bare copper wire or as scrap clippings, trimmings, etc. An essential is that the copper be pure and not contaminated with zinc, tin, lead, tellurium, beryllium, etc.

Mr. Jackson replied in response to a question on how much copper would be required in malleable iron to reduce annealing time 15 per cent, that it was not known definitely how much copper would be needed, or whether it would actually reduce the time to the extent mentioned, but work in progress might supply an answer later. Asked as to the effect of copper in promoting primary graphitization in malleable, he stated that there was a possibility, but by adjusting the silicon content he believed no trouble would occur. He pointed out that considering silicon as a factor of 1 in graphitizing action, copper only had a factor of one-fourth to one-fifth, and that appreciable amounts of copper could be added without running into trouble. Bearing on primary graphitization in malleable, a speaker from the floor stated that addition of molybdenum in combination with copper would prevent that trouble.

Reduce Silicon Content

To obtain the most benefit from copper additions to cast iron Mr. Jackson said that it is necessary to reduce the silicon content as in the case of other alloying agents. Small amounts aid in eliminating hard spots encountered in machining. A speaker from the floor pointed out that addition of 1 per cent copper to cast iron pipe used in condensers in oil refining increased the life 5 to 6 times, and that the addition of a similar amount to iron used for flange pipe seemed to prevent cracking under the flange which might indicate an advantage for copper in intricate castings. He also stated that 2 per cent copper in welding rods used in joining the condensers prevented cathodic corrosion.

Another speaker stressed the advisability of always using pure electrolytic copper for additions to cast iron. He cited an instance where copper additions had resulted in a highly chilled product which should have been gray. Investigation finally showed tellurium to be the cause, and that exceedingly small amounts of that element would change the structure from gray to white. In fact addition of 0.00022 per cent tellurium would result in a chill of $\frac{1}{8}$-inch.

Your Audience — your Message

AT THE 45th ANNUAL A·F·A CONVENTION

HOTEL PENNSYLVANIA — NEW YORK CITY — MAY 12-13-14-15, 1941

When the first of the meetings of the 45th Annual Convention of the American Foundrymen's Association opens at the Hotel Pennsylvania in New York on Monday, May 12th, literally the entire foundry industry will be "listening in" to catch the key note which will ring out to the metal casting industry. To all manufacturers of foundry equipment, supplies and accessories this vast audience will be in a receptive mood. The complete story of your products should be told in the May Pre-Convention and the June Post-Convention issues of The FOUNDRY.

MAY PRE-CONVENTION ISSUE—

This special issue of The Foundry this year will be more important than ever and through both its editorial and advertising pages will bring help and advice to its thousands of readers wherever metals are cast. Placed in the hands of readers well in advance of the opening of the convention, this issue will carry a complete preview of the occasion . . . program of meetings . . . technical sessions . . . plant visitations . . . social functions . . . New York as a foundry center . . . etc. . . . ALL in addition to the many features of any issue of The Foundry.

JUNE POST-CONVENTION ISSUE—

The June issue of The Foundry will contain a message to the entire foundry industry, also a detailed story of the convention, news of what happened, reports of the technical sessions and will be an accurate printed record of the 1941 convention. For those foundrymen who go to New York, this issue will be a reminder of a profitable contact with their fellow foundrymen. For those who cannot attend it will be the convention itself! Truly a marketing opportunity of the greatest importance which should not be overlooked.

Reserve Your Advertising Space in The 1941 Convention Issues NOW!

MAY PRE-CONVENTION ISSUE

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Comment

BY THE time this issue reaches its readers, the committee appointed by the Wage and Hour Division of the United States Department of Labor to recommend a minimum wage for the gray iron industry will have met and probably made its report. As is mentioned elsewhere in this issue, the committee is made up of five men listed as representing the public, five foundrymen and five labor leaders. I wonder how many of the men listed as representing the public are at all familiar with the problems or the products of the foundry, or have a clear idea of the application of castings in the every day life of the civilian population.

It is interesting to note that the department has defined the gray iron jobbing foundry industry as the "manufacture of ferrous or ferrous base castings, rough or machined, except malleable iron castings, steel castings, pipe and pipe fittings, for sale by the producer but not the manufacture of the same for use by the producer in the fabrication of other products or parts thereof." Unless the recommendation nearly approximates that in other closely related fields, some fine hair splitting will be necessary.

— □ —

In establishing a loan fund of $500 at Marquette University last June to aid deserving students, the Wisconsin Chapter of the A.F.A. performed a real service to the foundry industry of that district. Such a project should increase interest of engineering students in the foundry industry, and thus provide one source of young foundry engineers for years to come.

— □ —

The Defense Contract Service, organized to provide more complete utilization of the entire industrial production facilities of the country through sub-contracting, now is functioning through the 12 offices and 24 branches of the Federal Reserve System.

— □ —

The following word from an old foundryman in England is most interesting: "Just a word in passing. The skilled molder is a very important man today and is much sought after. His output of castings is contributing immensely to the war effort. There are no 'too old at forty' molders in Great Britain just now, and it is common talk to hear of foundrymen back on the foundry floor doing their job and doing it well at round-about 70 years of age. Of course, Jerry has given us a few unpleasant moments with his dive-bombers, but in this particular foundry where I am employed, we have not missed a day's cast up to now. (Several words removed by the censor) a mile or two away, although this story cannot be told at present, interesting as it is, and the steel bombs are still being poured."

— □ —

CHIEF of the Machine Tool Section, Office of Production Management, recently made an urgent appeal for immediate sale of idle machine tools to manufacturers working on defense contracts. Undoubtedly, many items of foundry equipment still are idle and might be put to use, either through sale direct to defense contractors or through used equipment dealers.

— □ —

The future of the foundry industry depends in large measure upon effort put forth today to increase the field of usefulness. This point is well developed in the following editorial from *Canadian Metals and Metallurgical Industries*:

> During the past decade, the foundry industry has solved a great many of its production problems, chiefly by the application of sound metallurgical common sense. Technical progress has resulted from a reasonable combination of metallurgy and knowledge, resulting from years of experience in the practical requirements of efficient casting production.
>
> While this important advance in production has been taking place, there has been no comparable progress in the education of possible users to the advantages of castings for many applications. This lag in the sales endeavour of the foundry industry has been most serious in view of the intensive programs of customer education which have been undertaken by phases of the metal industry whose products are competitive for many purposes.
>
> At the present time, with many foundries handling all the work of which they are capable, the incentive to a campaign to demonstrate the increases in the potentialities of castings which have resulted from better manufacturing techniques, and the use of new high-strength irons, etc., may be materially reduced. However, it would not appear to be wise to dismiss the idea in this way, for this period of intensive manufacturing for war requirements may be of the greatest importance in its influence upon production methods in years to come. To the criticism that the ban on new models may result in a deterioration in our national skill in design and production, it has been pointed out that our industrial talents will be offered every chance for development along lines of war equipment. Under these circumstances, the part that castings play in our program of war production may be one of the great factors in defining the opportunities for the casting industry in the period after the war.
>
> For this reason, the foundry industry should utilize every opportunity to see that castings are utilized whenever their properties offer advantages in construction of war equipment.

— □ —

Some purchasers of gray iron castings, especially for the machine tool field, have reported to Washington that "the gray iron foundry industry" is profiteering through excessive prices on "plain block castings" that require no skill or special equipment to produce. Undoubtedly those complaining have not told the entire story. Due to the enormous expansion of the machine tool industry, it has been necessary for companies to go further afield to find sources of supply for castings. In so doing it has been necessary to engage the services of companies previously not making that particular type of work, and of course such producers must demand a higher price than the foundry of the machine tool manufacturer specializing in machine castings. In spite of higher cost of raw materials, labor, taxes, etc., the general average price of gray iron machine tool castings is only slightly, if any higher than in 1937, when certainly profits were not excessive. Such rumors bandied about in Washington, do the industry considerable harm.

F. G. S.

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PORT WASHINGTON, WIS., DEPT. 177

MODERN EQUIPMENT CO.

DETROIT

By A. H. ALLEN
Detroit Editor, The Foundry

LOCAL foundries squarely in the midst of their busy automotive season as preliminary work on new models starts find a large volume of orders for castings resulting from the accelerated defense program has been dumped on top of that. Principal demand for castings does not come directly for armament material, but rather for plants and equipment needed to fashion guns, shells, tanks, trucks and other materiel of war.

Automotive programs are from four to six weeks ahead of schedule, and while the volume of die work is nowhere near what it was last year at this time, still there is enough to indicate that a good many changes are being contemplated in new cars. Some of the die programs are far enough along to suggest that die tryouts will be made this month and a few assemblies perhaps late in May.

Scramble for scrap by foundries in this district has been a furious one. Heavy demand and scant supplies have driven prices of foundry scrap upward.

One of the big hurdles in determining specifications for new car models has been the development of shortages in vital metals, such as zinc, aluminum, nickel, etc. This has compelled designers to work out wholesale substitutions in such things as radiator grilles, door handles, plated trimwork, pistons, as well as in many types of dies used to fabricate automobile parts.

As far as foundries are concerned, the main story right now is pistons. For the past six or seven years, nearly all passenger car engines have used pistons of aluminum alloy, cast in permanent molds and weighing, in the finished condition without rings, pin or bushing, from 14 to 20 ounces. Only Ford, Chevrolet and Pontiac at present use ferrous pistons, the latter two a soft gray iron cast by Chevrolet gray iron foundry in Saginaw, and all the Ford lines a cast steel, which casting process was described in THE FOUNDRY for April, 1936.

Ford has used some aluminum pistons for special motors such as trucks and the like, but in the main sticks to the high-strength cast steel material which has permitted lightening the piston section to such an extent that finished weight is only 12 ounces, or comparable with aluminum as far as weight is concerned.

Engineers studying wood models of some of the heavy armor plate castings used in 25-ton medium tanks to be assembled in the new Chrysler tank arsenal in Detroit. In the background are large "parts boards" on which each part going into the tank is listed, together with machines, fixtures and gages required for its fabrication, material involved and operations necessary. Part in the foreground appears to be a section of a housing for the 75-millimeter gun the tank will mount

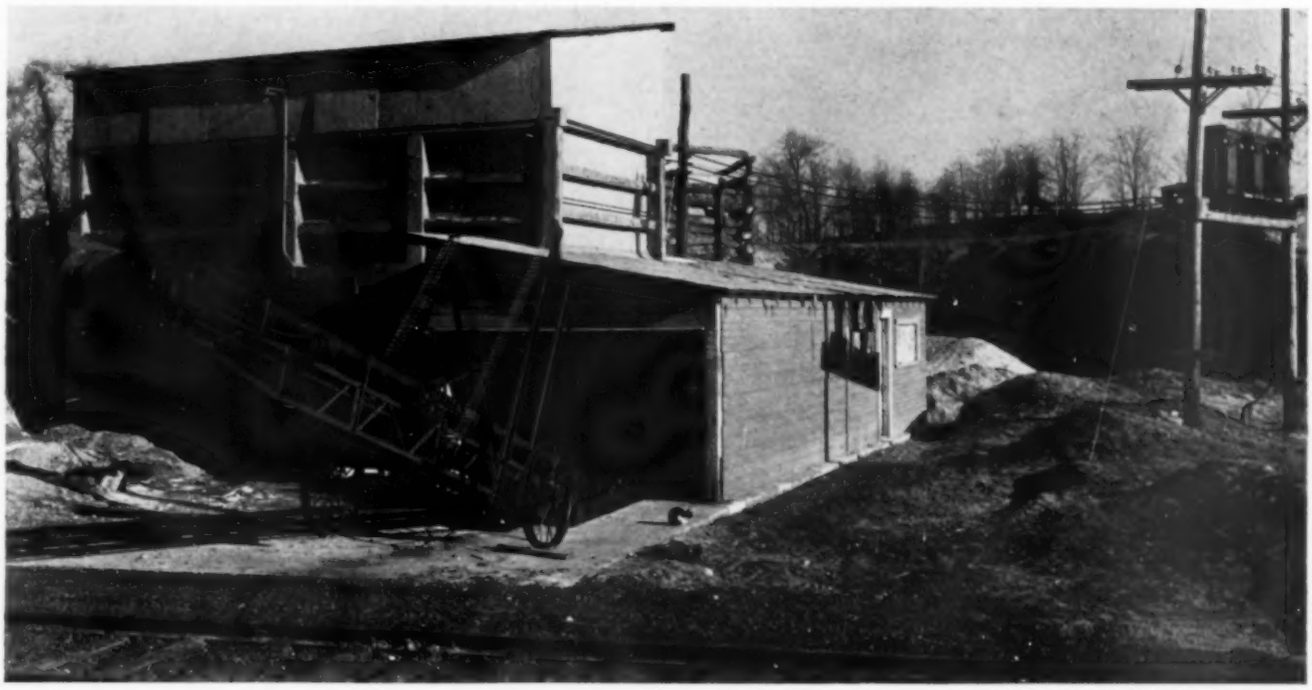
Make Alloy Iron Pistons

The cast iron pistons used by Chevrolet and Pontiac weigh 26.8 ounces for Chevrolet, 24.6 for the Pontiac six and 27 for the Pontiac eight. They are cast in green sand molds, usually four to the mold, cores being also green sand and integral with the drag. Iron is a soft material with total carbon around 3.40 per cent, combined carbon only 0.40 per cent, silicon about 2.50 per cent, manganese 0.60 per cent, phosphorus 0.30 per cent, sulphur 0.12 per cent, and usually residual amounts of alloying elements such as chromium, copper, molybdenum, vanadium, titanium or nickel. Pontiac, for example, advertises its pistons as nickel-chrome iron, nickel running around 0.15 per cent and chrome 0.20 per cent.

The cast iron pistons are electroplated with tin to improve run-in characteristics and to minimize initial scuffing in new engines. This discovery was made by C. F. Smart, Pontiac metallurgist, over ten years ago, when, in fitting out an engine for a test car, he had a block rebored and found he had no pistons large enough to fit the larger bore. So he suggested plating up some available pistons, and performance was so exceptional that it was not long until tin plating became standard practice. In fact, a good many aluminum pistons are tin plated—

(Concluded on page 78)

GREAT LAKES' NEW INDIANA PLANT



View of New Plant at Lake Cicott, Ind.

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Featuring LABORATORY CONTROLLED

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Better castings can be made with controlled sand, heretofore available only to those plants having costly mixing and handling equipment.

The services of our sand specialists are available to you upon request, for consultation and survey to determine the proper *BOND-BLENDED* sand to improve your foundry practice. Investigate the merits of *BOND-BLENDED* sand.

Great Lakes Foundry Sand Co.

UNITED ARTISTS BLDG. DETROIT, MICHIGAN

MINERS—PROCESSORS—FOUNDRY, METALLURGICAL AND SAND BLAST SERVICE

(*Concluded from page* 76)

those for Packard, Nash, Studebaker and Dodge engines being so treated.

Primary sources of aluminum pistons are Bohn Aluminum & Brass Corp., Aluminum Co. of America, and the Amplex division of Chrysler Corp. It is not necessary to use virgin aluminum for piston mixtures, although some pistons have been made with only low percentages of scrap or secondary aluminum. Today with the bulk of new aluminum earmarked for the aircraft industry, proportions of secondary aluminum in piston mixtures has been stepped up, Amplex using as high as 90 per cent secondary, if not more.

Unfortunately, through a combination of circumstances, even supplies of secondary aluminum have dried up, and prices on the material a few weeks ago soared up to as high as 26 cents a pound, compared with the base ingot price on virgin aluminum of 17 cents.

May Change To Cast Iron

Unless a greater supply of scrap aluminum can be developed, the motor industry is going to have to switch over to cast iron pistons; and it is reported that several companies already have decided to make such a change. Buick and Olds are said to have placed orders for electroplating equipment and to have run some tests on sample iron pistons.

Chief advantages of aluminum pistons over cast iron include the 40 to 50 per cent saving in weight, the improved heat conductivity of aluminum, and greater ease and speed of machining and finishing. Disadvantages are comparatively high cost of aluminum on a per pound basis, and the varying expansion coefficients of aluminum and cast iron. The latter always has been a problem in engines with aluminum pistons, though in recent years, with the introduction of low-expansion alloys and the use of Invar struts, the bad effects have been minimized.

Perfection of a suitable alloy iron, perhaps one that could be heat treated after machining to develop optimum physical properties so that the present sections used in iron pistons could be halved, might result in cast iron pistons coming back to stay instead of just being considered a stopgap. Ford has accomplished this with cast steel, but whether a harder piston material might result in increased cylinder bore wear, tin plating notwithstanding, is a moot question.

It is possible to cast iron pistons in permanent molds, which would overcome objections to excessive amount of machining on sand cast pistons, but dry sand cores would be necessary and that might throw costs too far out of line.

The Buick foundry probably will have to carry the load, as far as cast iron pistons are concerned. Pontiac foundry is not equipped for the work and is said to be in a position where it could not set up conveniently to handle pistons. However, the Buick foundry, even after relinquishing some Olds work to Pontiac, is by no means languishing for castings jobs, and likely will be hard pressed to take on piston production, particularly if it is expected to supply Olds and Cadillac as well as Buick. Of course, Chevrolet Gray Iron may be able to step up piston production somewhat, which would relieve the load on Buick.

Omer Allen, foundry superintendent, Pontiac Motor division, inspects steelwork already in place for a 26,000 square foot addition to the foundry's mill and core rooms. Previous work on Pontiac's Foundry last summer has hiked daily capacity from 550 to 775 tons of gray iron castings

Steelwork for the 26,000 square-foot addition to the cleaning department and core room of the Pontiac foundry is now in place. New machinery and equipment will include nine tumbling mills, another battery of swing grinders, conveyors to move small castings to the tumbling mills, three core ovens to supplement the present four, and additional welding furnaces.

The second floor of the present foundry office will be extended for a foremen's locker and shower room and a new conference room. Highest daily tonnage at Pontiac this year has been 796 tons, with normal two-shift operations averaging 725 to 775 tons. A year ago, 550 tons was considered tops.

To those whose familiarity with castings does not extend much beyond the run-of-mine automotive castings, a look at some of the amazingly heavy armor plate castings to be used in 25-ton tanks by Chrysler here at its tank arsenal is a revelation. Not only are a good many castings used in the tank assembly, but still others are required in the heavy assembly jigs being installed to facilitate holding the various elements in place while they are being riveted or otherwise joined. Largest casting in the tank itself is probably the revolving turret on the top, although there are others weighing a ton and upward. The castings are supplied by companies like American Steel Foundries and Continental Roll & Steel Foundry Co., and shipped in here for the final machining and assembly operations.

Adventures of Bill

(*Concluded from page* 62)

analysis. The situation boils itself down to this: Ingot metal costs a little more than scrap, but the extra cost may be charged off to insurance.

"The silly rumor that the ingot makers extract the copper, tin, lead and zinc, can be hung up on the old barn door with the snake who steals the cow's milk and the other snake which sticks its tail in its mouth, converts itself into a hoop, rolls down the road and transfixes its victim on a pair of sharp horns. Practically all the ingot makers have had long and honorable careers. One in Chicago recently celebrated the 50th anniversary. These men are more jealous than many foundrymen of their business reputation.

"The specific metal to which you refer, a bearing bronze for moderate loads and speeds is poured at different temperatures depending on the size and bulk of the casting, light castings 2100 degrees, medium weight 2000 degrees and heavy castings 1950 degrees Fahr. A 100-pound pot of metal is deoxidized with 4 ounces of 15 per cent phosphor copper. This metal shows tensile strength 35,000 pounds per square inch, yield point 10,000 pounds, elongation 8 and reduction in area 8 per cent, brinell 50 and shrinkage 3/16-inch per foot. With proper care there is practically no loss in the copper, tin or lead. In mixtures containing zinc approximately 1 per cent usually is allowed for melting loss."

Reznor Mfg. Co., Mercer, Pa., makers of unit heaters, forced air circulators, and other gas fired heating equipment, has appointed John Payton district manager for the Indiana and east central Illinois territory. Mr. Payton's headquarters are at 1245 West Thirtieth street, Indianapolis.

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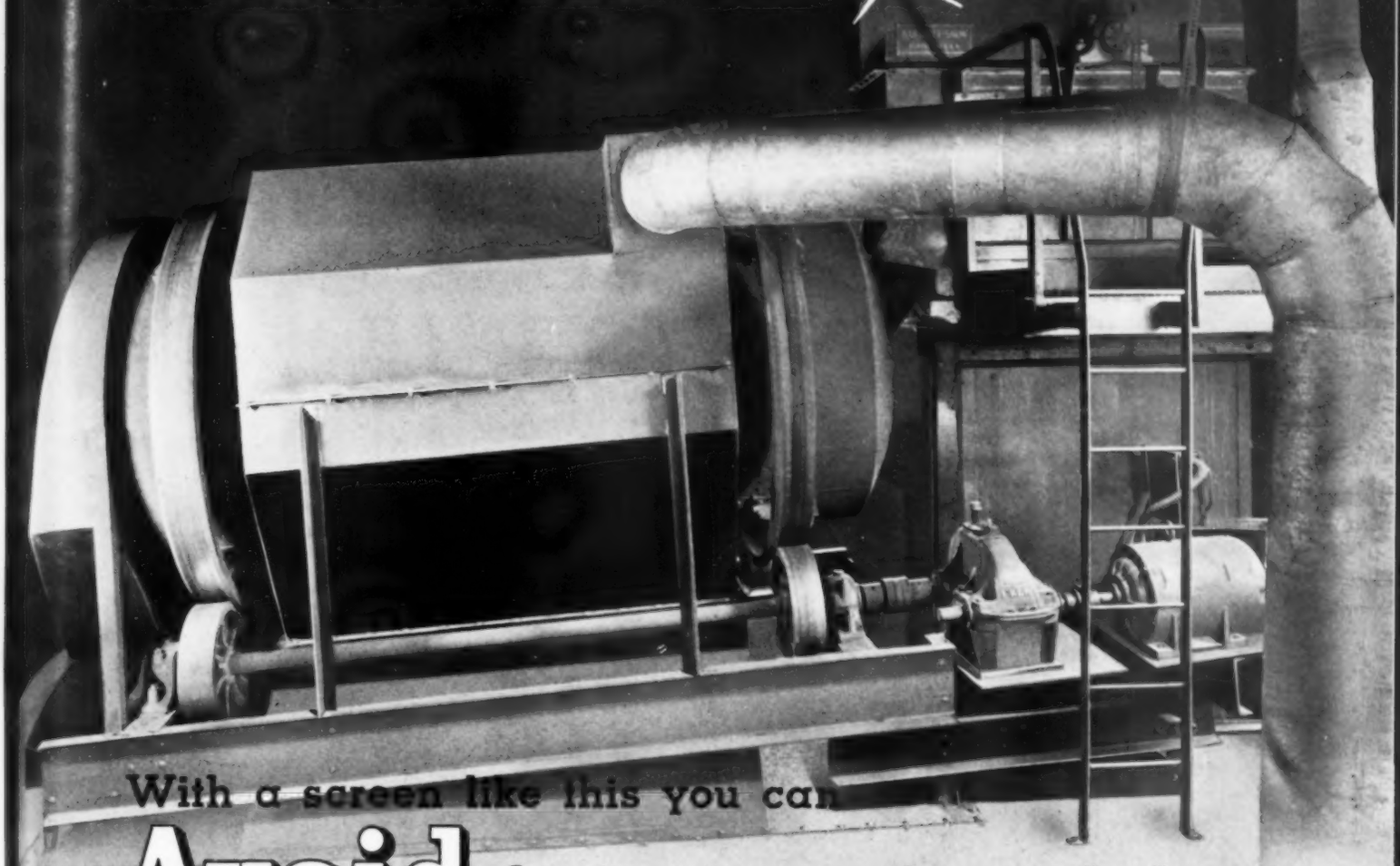

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● Fully housed in and vented to a dust collector, this revolving screen in the plant of one of the country's nationally known radiator manufacturers cleans 60 tons of sand an hour with almost no dust loss at all. Flights on the inside lift the sand and drop it against the bottom breaking up the lumps. The screen may be provided if desired with a breaker section to break up extremely heavy, hard packed molds, also with an interior exhaust pipe for removal of fines. These screens are usually mounted overhead to save floor space but they may be placed at floor level. They handle dry, wet, hot, cold or any intermediate condition of sand and are available in sizes from 30″ to 84″ in diameter and different lengths to meet various requirements—eliminating any dust nuisance from sand cleaning at its source. Complete details, including prices, weights, capacities, etc., furnished on request.

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	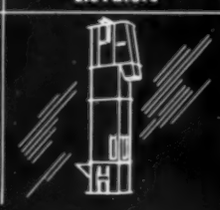		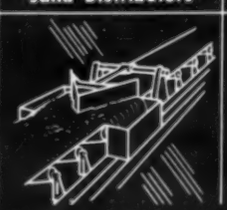	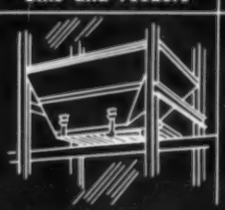		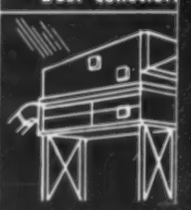

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FOUNDRY DEVELOPMENTS AT SHORT RANGE

IN a study conducted in Germany on loss of manganese in open-hearth practice it was found that considerable decrease could be obtained by arranging the ladle into which the steel is tapped, so that it could be tilted to permit the molten metal to flow down the wall without turbulence and entrainment of air. In other words—at the beginning of tapping the bottom of the ladle is raised so that the ladle is almost horizontal, and as it fills, the line attached to the bottom is slacked off gradually until at the end of tapping, the ladle is in its usual vertical position. Consequently, the method employed is quite similar to that developed by Durville for obtaining sound, clean ingots of aluminum bronze.

* * *

Addition of molybdenum to cast iron gear material containing chromium and nickel is reported to have eliminated machining difficulty and provided and economical solution to the automotive distributor gear problem. One composition used for the purpose contained 2.10 to 2.30 per cent silicon, 0.60 to 0.70 per cent manganese, 0.20 to 0.30 per cent nickel, 0.60 to 0.80 per cent chromium, 0.50 to 0.60 per cent molybdenum, and 3.20 to 3.40 per cent total carbon.

* * *

Foundries using a pickling process or contemplating installation of the same should keep in mind the following notation taken from *Code of Recommended Good Practices for Metal Cleaning Sanitation* published by the A.F.A.: All acid solutions of pickling strength are toxic, and in addition, constitute an accident hazard if the acid solutions come in contact with the eyes or body and produce extreme irritations, and at elevated temperatures cause severe acid burns. Certain pickling acids are more hazardous than others, particularly nitric and hydrofluoric acids. Hydrochloric and sulphuric acids are somewhat less hazardous from the health point of view. Exposure to the concentrated fumes and acid mist arising from pickling operations constitutes a definite health hazard. Inhalation of these fumes over a period of time may cause chronic irritation of the respiratory tract. This irritation renders those exposed, more subject to other infections. Acid fumes and mist attack the enamel of teeth and accelerate decay.

* * *

TO PROVIDE an iron which is resistant to wear a recent patent describes a cast material containing titanium, copper and chromium. Designed for such parts as cylinder liners, pistons and piston rings, valves and valve guides, tappets, bearings, etc., the material is claimed to resist scoring, and is easy to machine. In addition it is said that it will provide high strength in large size castings as well as good hardness in the center of thick sections. The alloy iron is said to possess extra good fluidity and is melted easily in the cupola. Broad composition specification shows 2.25 to 4.00 per cent carbon; 1.50 to 3.50 per cent silicon; 0.05 to 0.60 per cent titanium; 0.50 to 1.50 per cent copper; 0.30 to 1.00 per cent manganese, and 0.40 to 2.00 per cent chromium. A narrower range is given at 2.75 to 3.75 per cent carbon; 2.00 to 3.20 per cent silicon; 0.10 to 0.45 per cent titanium; 0.55 to 1.10 per cent copper; 0.40 to 0.80 per cent manganese, and 0.50 to 1.25 per cent chromium.

* * *

A new gas-carburizing electric furnace for case-hardening steel parts has been developed, which is said to possess outstanding advantages. It is claimed that savings as high as 75 and 80 per cent have been made under some conditions due to shortened carburizing cycle, elimination of packing material, and improvement in quality and uniformity of the parts carburized.

* * *

RECENT German patent refers to a method of lining a light metal engine cylinder with a layer consisting of a harder metal and one having a higher melting point, by means of a centrifugal casting process. The molten metal to serve as the lining is contained in a pot provided with a nozzle at its lower end and inclined at a downward angle to the cylinder wall, against which the metal is sprayed directly while both pot and cylinder are being spun about vertical axis in opposite directions to each other. The pot of metal is mounted on the end of a vertical shaft passing through the axis of the cylinder, and means are provided for moving the pot up and down in the cylinder. Molten metal is deposited spirally on the inner wall of the light metal cylinder in such a thin stream, that it solidifies with alloy formation with the metal of the cylinder where deposited, and the high speed of rotation of the light metal cylinder while the metal is being sprayed on, causes the spiral layers of the stream of metal to flow together and form an internally smooth layer of uniform thickness throughout.

* * *

In a recent test in a Western gold mine sand-cast alloy iron grinding balls showed a wear rate of 2.25 pounds per ton of ore against 3.00 pounds per ton of ore for forged steel balls or an improvement of 25 per cent. The cast balls contain 1 to 2 per cent nickel and 0.60 to 1.50 per cent chromium. Sand-cast balls have a hardness of 500 brinell while chill-cast balls run up to 625 brinell.

Wisconsin STAGES FOURTH REGIONAL

A RECORD attendance of approximately 750 foundrymen from a radius of 100 miles marked the fourth regional foundry conference at the Schroeder hotel, Milwaukee, Feb. 20 and 21, held under the joint auspices of the Wisconsin Chapter A. F. A. and the department of mining and metallurgy, University of Wisconsin, Madison, Wis. An able committee under the joint chairmanship of A. C. Ziebell, Universal Foundry Co., Oshkosh, and Prof. J. F. Oesterle, college of engineering, University of Wisconsin, and backed by experience gained in three former conferences, laid out a highly interesting program and carried it through with clock like precision. A brief reference will show the ambitious extent of the presentation which included four general meetings, five technical sessions, two luncheon meetings and one dinner meeting. General meetings, luncheons and dinner, were held in the crystal ball room.

At the opening meetings under the chairmanship of B. D. Claffey, General Malleable Corp., Waukesha, Dean F. Ellis Johnson, college of engineering, University of Wisconsin, extended the official welcome, referred to a Wisconsin Chapter loan fund which enables deserving boys to complete their work at the university, the value of education, potential resources of the coming generation and dwelt for some length on a book written several years ago on the 15 great decisive battles of the world and a comparison by the author with 15 notable inventions during the past 100 years or less. The list included lenses, microscope, telescope, explosives, magnetic compass, printing press, blast furnace, steam engine, power loom, telegraph, light photography and radio. War, he declared, might settle some political boundaries, but peace time inventions marked the progress of civilization, changes in living conditions and methods of carrying on the world's work. He pointed out the the majority of inventions were the joint result of many men's ideas, sometimes in collaboration, but frequently unrelated in the preliminary stages. Whereas formerly ideas and methods were shrouded in secrecy, the present trend is toward frankness and exchange of ideas. The conference illustrated that idea.

At the first luncheon meeting, Carl F. Zeidler, mayor of Milwaukee, reviewed past and present industrial conditions in the city and confidently looked forward to the day when Milwaukee will be expanded beyond present imagination and a community where all the human elements, vitalized by industry, the main spring of any city's economic life, will be fused perfectly in friendly and co-operative understanding.

Memory Training Important

At the general session, Victor L. Short, Institute of Human Science, Springfield, Mass., presented an interesting address on the human element factor in business. Illustrating the point that memory training is not only feasible, but also highly essential, he demonstrated by practical example how the memory can be developed to a high state of efficiency. To show how a trained investigator or prospective employer can arrive at a fairly accurate estimate of a candidate's physical and mental makeup, habits, customs and reactions to various forms of intercourse, social and industrial with other members of the human race, the speaker selected three members at random from the audience and presented a rapid analysis. The candidates shyly admitted that he was nearly right, but the audience in high and noisy approval declared that he was absolutely right. Umpire Claffey from the chair refused to give a decision, but admitted that the speaker had a slight edge on points.

Hon. Martin Dies, member of congress and chairman of the committee investigating un-American activities, was scheduled to speak at the dinner meeting Thursday night. Unfortunately Mr. Dies had to cancel the engagement on account of illness. His place was ably taken by Carl J. Hambro, president of the Norwegian parliament at the time of the German invasion. Mr. Hambro who speaks English fluently, presented a vivid and first hand account of conditions prevailing before, during and after the seizure.

Speaks on Arsenal

Brig. Gen. N. F. Ramsey, commanding officer, Rock Island Arsenal, Rock Island, Ill., speaking at the Friday luncheon meeting, referred first to six arsenals of the War Department engaged in the manufacture of arms, ammunition, and equipment. In a more detailed description of the Rock Island Arsenal he covered the historical features, fluctuations of personnel at various periods from a few hundred to 13,000, problems of readjustment after the world war and present activities. Disbursement in 1938 was $7,000,000, in 1939 this had increased to $11,000,000, in 1940 to $17,000,000 and it is estimated that in 1941 the figure will touch $150,000,000. Most of the expenditure is represented in contracts with outside firms. According to the present outlook the arsenal will be fully engaged for 1½ and possibly 2 years to clean up the work now in hand. He concluded by paying an enthusiastic tribute to the personnel who have grown up, stayed for long periods and established the reputation of the arsenal as a highly efficient and modern manufacturing plant.

The final general session Friday afternoon was featured by an address by L. V. Boardman, special agent in charge of the Federal Bureau of Investigation, Milwaukee district. He described the work of the bureau in connection with the

secret and under cover activities of individuals and organizations treacherously interfering with the National Defense program. Potential sabotage is a constant menace and can be prevented only by unceasing vigilance, by rigid inspection of all who enter industrial plants, either as employes or for any other purpose, and by prompt and decisive disciplinary methods wherever necessary.

Two technical sessions were held on Thursday, the first from 10.45 to 12 noon, and the other from 1.45 to 3.20 p. m. The same hours were observed on Friday, with the exception that an early session was held from 9 to 10.15 a. m. At each session the groups met simultaneously in four different rooms to discuss certain features in connection with gray iron, malleable iron, steel and nonferrous foundry operation, technique and practice. Speakers at the gray iron meetings discussed patterns, core binders, molding, melting practice, cleaning and salvaging castings. Steel discussion centered around flowability, controlled solidification, heads and gates, gamma ray inspection, equipment maintenance. Malleable foundrymen were interested in melting practice, defective castings, sand, and shop equipment. Nonferrous subjects included army inspection, aluminum, crucible melting, cost systems and top pouring.

Under the chairmanship of W. P. Schmidt, Falk Corp., and A. M. Fischer, Jurack Pattern Works, Milwaukee, Vaughan Reid, president, City Pattern Works, Detroit, pointed out the difference between patterns constructed for short and long runs. Patterns for long running jobs should be solid and substantial, designed to facilitate molding and of course highly accurate in dimensions. This involves the use of the highest class equipment, materials and skilled operators. A

(*Continued on page* 86)

Wisconsin Chapter had a record turnout at its fourth regional conferenc held in Milwaukee. Photos courtesy of John Bing, A. P. Green Fire Brick Co., Milwaukee

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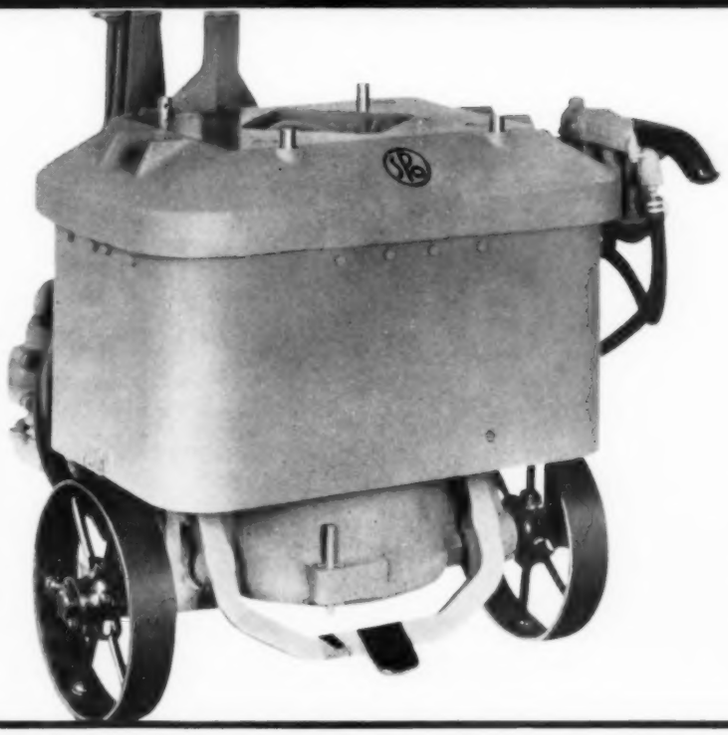

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Uniformity—the all-important consideration in castings. Uniform density and uniform permeability,—get those qualities in your molds and you are "all set". To get them, reduce the human equation. SPO Oscillating Squeeze Strip Machines do exactly that.

This *new* molding equipment practically rules out the human tendency to err and vary. Your operator simply fills his flask and pushes a handle. He scarcely has to do any thinking at all.

Another reason for uniformity. The sand is kept in continuous motion, flowing around the pattern as long as the pressure is on. *The grains interlock*, making your molds more uniformly dense and permeable. Tucking and peening are almost unknown.

SPO Oscillating Squeeze Strip Machines are fast. They meet today's unprecedented demands for high production, yet hold the closest of tolerances. You have here the advantages of the jolt and squeeze methods without such advantages as very hard and soft spots and ram-offs. Both stationary and portable models are available.

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(*Continued from page* 84)

number of slides showed how the speaker's large establishment is equipped and operated to meet the highest standards of hygiene, sanitation, design, operation, etc.

Characteristics of binders in various core sands were described by J. A. Gitzen, Delta Oil Products, at the second gray iron session presided over by D. I. Dobson, General Malleable Corp., Waukesha, and Leo Koenig, J. I. Case Co., Racine, Wis. All binders have a common purpose, to unite the sand grains in a more or less solid mass, but so many other factors are involved that a proper study of the subject leads one into problems of permeability, green and dry strength, combustion, temperatures, ratio of binder to sand, disintegration of sand after casting is poured, and relative costs.

Describes Molding Technique

Anthony Lebesch, Allis-Chalmers Mfg. Co., West Allis, described the molding technique involved in the production of large castings and Edwin S. Armstrong, International Harvester Co., Milwaukee, discussed production control problems at a session presided over by H. P. Kreulen, Spring City Foundry division, Waukesha, Wis., W. R. Jennings, John Deere Co., Waterloo, Ia., and Charles Zhan, Vilter Mfg. Co., Milwaukee. Mr. Armstrong claimed that the production department can operate efficiently only according to the anticipated demand determined by the sales department. Where there is a change in production, the foundry must be notified.

At the second session Friday, William Hambley, Allis-Chalmers Mfg. Co., West Allis, chairman, Howard Waldron, Nordberg Mfg. Co., Milwaukee, and Martin Chamara, Nash Motors Co., Kenosha, Wis., co-chairmen, Wm. H. Brooks, Allis-Chalmers Mfg. Co., described melting practice for jobbing and production foundries. Close control is essential under both conditions, but details in making up the charges to suit different classes of castings introduce more varying elements in the general jobbing foundry. At the final gray iron technical session Friday afternoon under the chairmanship of Harold Warner, Universal Foundry Co., Oshkosh, John M. Harris, Spring City Foundry division, Waukesha, discussed methods in cleaning room inspection while Herb Quartz, Allis-Chalmers Mfg. Co., West Allis, described accepted methods for salvaging castings presenting minor defects.

Paul C. Power, Maynard Electric Steel Casting Co., Milwaukee, presided at the first steel session where Dr. C. H. Lorig, Battelle Memorial Institute, Columbus, O., described in considerable detail a series of tests designed to measure the flowability of cast steel under various conditions. Results of the experiments in the foundry showed that the method had the necessary attributes of a workable plant test. As might be expected, temperature of the metal is one if not the most important factor. With Fred Pritzlaf, Falk Corp., in the chair, Stanley W. Brinson, master molder, Norfolk Navy Yard, Norfolk, Va., presented a paper showing the methods employed in controlled directional solidification in steel castings.

At succeeding steel sessions presided over by Fred Pritzlaf, David Zuege, Sivyer Steel Casting Co., Milwaukee, and James Ewens, Milwaukee Steel Foundry division, Milwaukee, H. A. Forsberg, Continental Roll & Steel Foundry Co., East Chicago, Ind., outlined proper methods for heading and gating steel castings. Dr. Gilbert E. Doan, Lehigh University, Bethlehem, Pa., described gamma ray inspection of steel castings. James Thomson, Continental Roll & Steel Foundry Co., described the functions, duties and responsibilities of the maintenance engineer, the mechanical equipment employed, etc.

Discuss Air Corps Specifications

At the first nonferrous session presided over by W. W. Edens, Ampco Metal Co., Inc., Milwaukee, navy, federal and air corps specifications were discussed by Lt. H. M. Marshall and Nicholas Elliott, navy and ordnance inspection offices, and by P. C. Cunnick and H. A. Curtis, Rock Island Arsenal. Popular lack of information on salient features was cleared up by Mr. Cunnick's presentation of seven typical questions: 1—By what process are specifications written and who is responsible for the information. 2—How are purchases initiated. What sort of records are kept between the purchaser and the local ordnance or inspection office. 3—What are the normal procedures involved in inspection. Does the inspector have to be in attendance at the pouring of the metal. If not what leeways are allowed. 4—How are castings to be identified. Who is qualified to make the proper chemical and physical analyses. 5—In case of rejection on a point which may not influence the serviceability of the castings, who is to be contacted and what channels should be used. 6—Can certain requirements of a specification be waived by proper agreement between the purchaser and supplier. 7—What is the mechanism of having a specification changed permanently.

A carefully prepared paper, "The Metallurgy of Aluminum in Sand Castings", by George Starmann, Apex Smelting Co., Chicago, was presented at the second nonferrous session under the chairmanship of L. A. Pankratz, Quality Aluminum Co., Waukesha. Following a brief reference to the history and development of the metal, the speaker described aluminum alloys, casting methods, gating and feeders, sand, cores, furnaces, melting and casting methods, fluxes, shaking out and cleaning. In many instances cracks are prevented by allowing the castings to remain in the sand until they are cold. At the third session with A. K. Higgins, Allis-Chalmers Mfg. Co., in the chair, D. B. Milward, Electro Refractories & Alloys Corp., Buffalo, described crucible melting of nonferrous metals. Nonferrous foundry cost systems were explained at the fourth session by Ralph Lee, Liberty Foundry division, Wauwatosa, under the chairmanship of D. E. Stephens, H. Kramer Co., Chicago.

Pour Through Risers

At the final nonferrous session, W. W. Edens, Ampco Metal Co., Inc., Milwaukee, in the chair, A. K. Higgins, Allis-Chalmers Mfg. Co., Milwaukee, presented a report on the subject of pouring castings directly through the open risers.

The opening malleable iron session under the chairmanship of Prof. J. F. Oesterle, University of Wisconsin, and discussion leader Leon J. Wise, Chicago Malleable Castings Co., Chicago, was devoted principally to the subject of melting practice and more particularly to the composition and behavior of furnace bottoms. Claim was advanced that brick was more satisfactory than sand for the purpose. At the second session presided over by J. B. Gutenkunst, Milwaukee Malleable & Gray Iron Works, Milwaukee, Bert Stone, Belle City Malleable Iron Co., Racine, Wis., discussed the various qualities of molding and core sand most suitable for the production of malleable iron castings.

The third and fourth sessions under the chairmanship of James Lansing, Malleable Founders' Society, Cleveland, were in the form of a scrap clinic. A number of defective castings were reviewed and opinions expressed on the causes by a group of expert foundrymen, E. P. Meyer, Chain Belt Co., Milwaukee, Fred Voelkel, Federal Malleable Co., Milwaukee, M. H. Weaver, General Malleable Corp., Waukesha, V. F. Gapinski, Milwaukee Malleable & Gray Iron Works, Milwaukee, Peter Stoesser, Badger Malleable & Mfg. Co., South Milwaukee, R. J. Anderson, Belle City Malleable Iron Co., Racine, William Hoernke, Wisconsin Apple-

(*Concluded on page* 89)

(*Concluded from page 86*)

ton Co., South Milwaukee, Martin Harder, Lakeside Malleable Casting Co., Racine. Selection of molding and coremaking equipment for economical production was described by W. R. Jennings, John Deere Tractor Co., at the closing session with McLeod Lewis, Badger Malleable & Mfg. Co., in the chair.

Conference committee with names listed alphabetically included: John Bing, A. P. Green Fire Brick Co.; B. D. Claffey, General Malleable Corp.; Harry Donald, Interstate Equipment & Supply Co.; George Dreher, Ampco Metal Co.; Walter Edens, Ampco Metal Inc.; James Ewens, Milwaukee Steel Foundry Co.; Ray Flansburg, Belle City Malleable Iron Co.; Walter Gerlinger, Walter Gerlinger Inc.; Charles Gutenkunst, Milwaukee Malleable & Gray Iron Works; William Hambley, Allis-Chalmers Mfg. Co.; A. K. Higgins, Allis-Chalmers Mfg. Co.; Roy Jacobs, Standard Brass Works; R. F. Jordan, Sterling Wheelbarrow Co.; Harry Ladwig, Allis-Chalmers Mfg. Co.; McLeod Lewis, Badger Malleable & Mfg. Co.; William J. MacNeill, Federal Malleable Co.; Prof. J. F. Oesterle, University of Wisconsin; L. A. Pankratz, Quality Aluminum Co.; George Pendergast, Geo. M. Pendergast Co.; Paul Power, Maynard Steel Casting Co.; Fred Pritzlaff, Falk Corp.; Prof. E. R. Shorey, University of Wisconsin; D. E. Stephens, H. Kramer Co.; Howard Waldron, Nordberg Mfg. Co.; T. E. Ward, Badger Malleable & Mfg. Co.; A. C. Ziebell, Universal Foundry Co.; David Zuege, Sivyer Steel Casting Co.

Foundrymen within a radius of 100 miles journeyed to Milwaukee on Feb. 20 and 21 to attend the interesting sessions held at the Wisconsin conference. Photos courtesy of John Bing, A. P. Green Fire Brick Co., Milwaukee

Obituary

WALTER W. Cheney, 85, one of the founders and for many years president of S. Cheney & Son, Manlius, N. Y., died Feb. 26 at his home in Manlius. Mr. Cheney joined the firm in 1877, 11 years after it was started by his father, Stephen Cheney, and since that time has been identified with the gray iron foundry business and machine shop trade, and was well known throughout central New York. In earlier years Mr. Cheney was interested in politics and served as supervisor of the town of Manlius. During the administration of Governor Hill he was assemblyman in the New York state legislature for two terms. For many years he also was president of the Kelsey Heating Co., Syracuse; was a member of the board of the Bank of Manlius; senior warden of Christ Church, and president of Manlius village cemetery. Mr. Cheney was president of Manlius village for two terms and also served as a member of the Manlius board of education. He was chairman of the local draft board in Manlius, N. Y. during the previous world war.

* * *

Edward J. McDonough, president, Standard Foundry Co., Hartford, Conn., died recently at his home in that city.

* * *

Charles I. Ritchie, 49, plant surveyor since last May for Dyer Engineers, Inc., and former executive secretary Gray Iron Founders Society for six years, died in St. Vin-

Charles I. Ritchie

cent Charity hospital, Cleveland, Thursday, March 13. He served an apprenticeship with Warner & Swasey and later was assistant to his father, superintendent Babcock & Wilcox Co. He was with the Drew Electric Co., for a period until that company was merged with the Ohio Brass Co. Through his connection with the Gray Iron Founder's Society he traveled all over the country and was widely known in the foundry industry.

* * *

Paul E. McKinney, 56, metallurgical engineer on the central staff of the operating vice president, Bethlehem Steel Co., Bethlehem, Pa. died Feb. 18 at his home after a brief illness. Mr. McKinney was widely recognized as an authority on the metallurgy and production

Paul E. McKinney

of steel for ordnance. Before his affiliation with Bethlehem Steel Co. in 1929, he was superintendent of the Forge and Foundry division of the United States Naval Gun factory in Washington, where he served in various capacities since 1906. Prior experience also included work as assistant chief chemist, Reading Iron Co. from 1902 to 1904, and chemist, Warwick Iron & Steel Co., Pottstown, Pa., 1904 to 1906. Mr. McKinney was a member of many professional societies including American Foundrymen's Association.

* * *

William W. Crawford, 59, president and chairman, Edward Valve & Mfg. Co., Inc., East Chicago, Ind., died Feb. 19 in St. Francis hospital, Miami Beach, Fla. Mr. Crawford had held his present position with the company since 1923.

* * *

Lewis E. Saunders, 67, a vice president of Norton Co., Worcester, Mass., and a pioneer in the development of electric furnace abrasives, died Feb. 20 after an illness of 2 weeks. Mr. Saunders had been vice president of Norton Co. since 1937, and a director since 1921.

* * *

Daniel Peterkin Sr., 67, president of the Morton Salt Co., Chicago, since 1930, died in that city March 11. Mr. Peterkin suffered a heart attack in Los Angeles, March 2 and returned home shortly thereafter. Born in Aberdeen, Scotland, in 1883, he came to this country in 1892 and to Chicago in 1895 where he became associated with Joy Morton & Co. the following year.

* * *

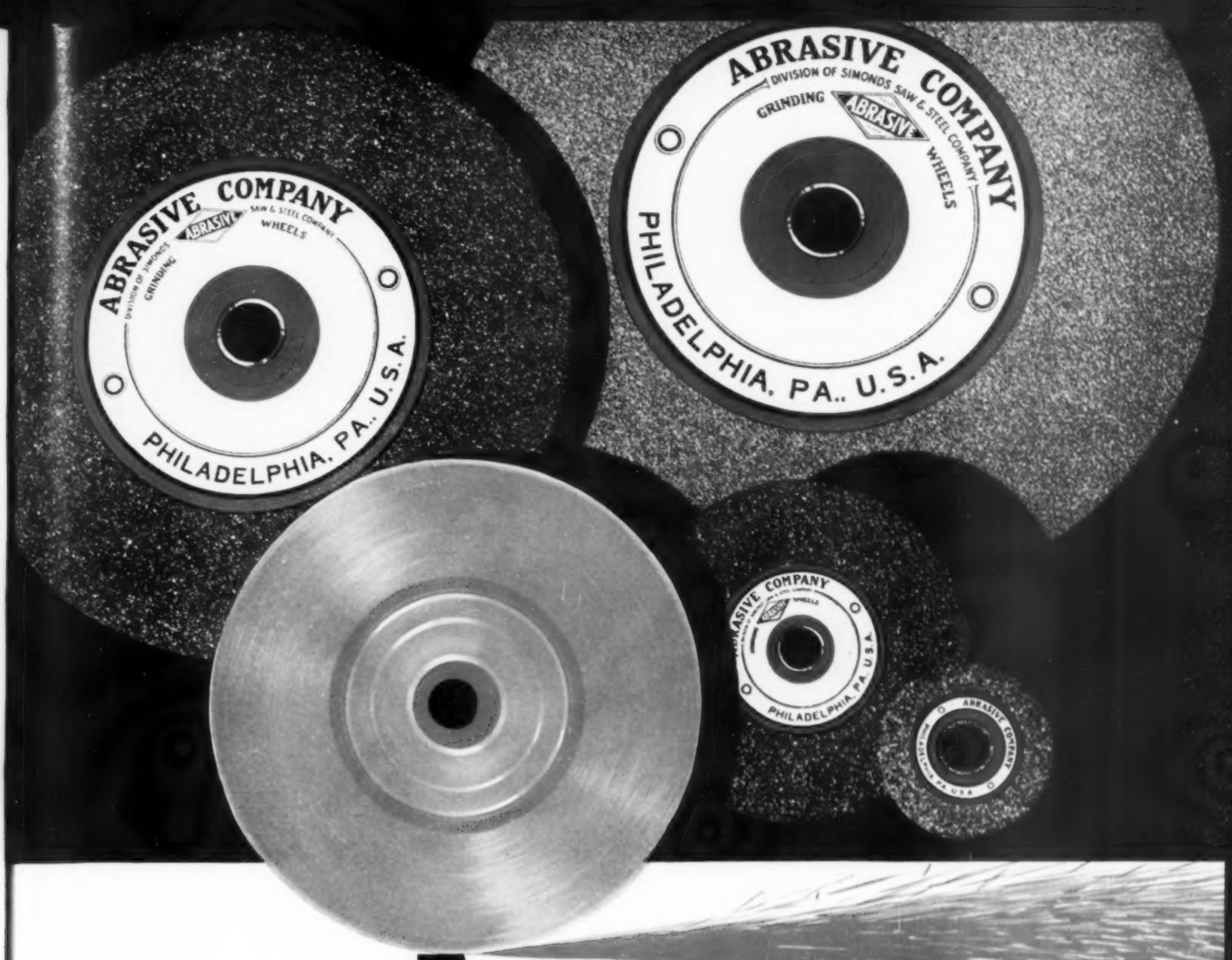
George Klenk, for many years superintendent, Allis-Chalmers brass foundry, and well known throughout the country in nonferrous foundry circles, died of a heart attack at his home in Milwaukee, Feb. 14. Mr. Klenk had been connected with Allis-Chalmers Mfg. Co. and its predecessor companies for more than 50 years. He was born in Milwaukee, Dec. 15, 1864. His foundry apprenticeship was with the Loeffelholz & Prier Brass Founders & Finishers, Milwaukee, where he started at the age of 13. After completing his 4 years, he went to Chicago to work for the Union Brass Foundry. Later he accepted a job with the Kadendish Coppersmith & Brass Founders, and after wide experience in brass and other alloy castings, he accepted a position as foreman at the James Lane Brass Foundry. In 1886 he returned to Milwaukee where he went with the William Mellen Brass Founders which did considerable work for the E. P. Allis Co., predecessor of Allis-Chalmers, and 2 years later he joined the E. P. Allis Co. to start its first brass foundry.

* * *

Thomas William Turner, superintendent of foundries, Ingersoll-Rand Co., Phillipsburg, N. J., died March 10 at Easton, Pa. after a short illness. He was 68 years old. Mr. Turner was born in Erith, Kent, England, and came to the United States in 1904. Shortly after he went to Canada, and for 16 years was manager of the Canadian Allis-

Thomas W. Turner

Chalmers and General Electric Co. foundries in Montreal and Toronto. He then returned to the United States and for 21 years was in charge of the Ingersoll-Rand foundry at Phillipsburg. Mr. Turner was a member of the American Foundrymen's Association.



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Foundry Activities

CONSTRUCTION has started on a new foundry and forge shop for the manufacture of aluminum alloy castings and forgings, by the Kinney Aluminum Foundry Co., Los Angeles. The new company will be managed by Grant E. Myers, formerly associated with the Kinney Iron Works, Los Angeles. The plant will be located in the Los Angeles industrial area and will employ approximately 250 men. The products of the new firm will be used principally by the rapidly growing aircraft industry. The first group of buildings will have an area of approximately 50,000 square feet. The company has been organized by Roland T. Kinney, vice president and Wendell H. Kinney, president of the Kinney Iron Works.

* * *

Massey-Harris Co. Ltd., 915 King street West, Toronto, Ont., is building a one-story addition 60 x 2000 feet.

* * *

Aluminum Alloy Casting Co., Los Angeles, is erecting and addition to its building at 2448 East Fifty-fifth street, at a cost of $3000.

* * *

Chain Belt Co., South Forty-sixth street and West Greenfield avenue, West Milwaukee, Wis., is building an addition to its plant.

* * *

National Foundry & Machine Co. Inc., Pawtucket, R. I., has been incorporated by Edward G. Fletcher, 29 Cabot street, and associates.

* * *

Wellman Engineering Co., 7000 Central avenue, Cleveland, is replacing foundry and machine tools in its long-idle plant on Ira avenue, Akron, O.

* * *

Ladel Conveyor Mfg. Co., 339 South Broadway, New Philadelphia, O., is building a foundry 70 x 160 feet. A .L. Schwab, is secretary-treasurer.

* * *

Union Metal Mfg. Co., 1432 Maple avenue N. E., Canton, O., has added 8000 square feet of floor space to its foundry and installed two new core ovens.

* * *

Walla Walla Machine & Foundry Co., 217 Paulsen building, Walla Walla, Wash, has been incorporated with $75,00 capital by Graham Boyd, W. B. Bartlett and James Stafford.

* * *

Castings Co. of America, 1300 North Main street, Los Angeles, is the firm name under which Langdon A. Pope has obtained a certificate to conduct business.

* * *

A certificate to conduct business in Los Angeles under the firm name of Cooperative Iron Foundry has been issued to Julian Ales, 2615 Manitou avenue and H. E. Skinner, 1564 Court street, Los Angeles.

* * *

Castle Foundry, New Castle, Pa., has been purchased by John A. Panella of that city. Mr. Panella has renamed the organization the Shenango Foundry, reconditioned the plant and resumed operations.

* * *

Argos Foundry, Plymouth, Ind., was damaged by fire to the extent of $5000 to $10,000. The property was insured and rebuilding has begun. Owners are William and Samuel Schlosser Jr.

* * *

Benton Harbor Malleable Industries, Benton Harbor, Mich., is constructing an addition 56 x 120 feet to its gray iron plant. The addition increases the potential production by 10 to 15 per cent.

* * *

Standard Foundry Co. Inc., 410 South Carroll street, Wabash, Ind., has been incorporated to operate a foundry by Elmer F. Mattern, 278 West Maple street and associates.

* * *

Gunite Foundries Corp., 302 Peoples avenue, Rockford, Ill., has been awarded a contract by the War Department to construct and equip a foundry to manufacture special castings. Total cost is estimated to be about $200,000.

* * *

Los Angeles-Glendale Foundry, 4913 San Fernando road, Los Angeles, has been incorporated and the name changed to the Jewel City Foundry Co. It will manufacture gray iron, aluminum, brass and alloy castings.

* * *

U. S. Foundry Inc., Cleveland, a new corporation, has taken over the plant of the U. S. Brass Corp., 1276 East Fifty-fifth street, and has started production. Peter E. Klein, Union Commerce building, is in charge pending election of officers.

* * *

Northern Pump Co., 920 Eighteenth avenue N. E., Minneapolis, is expanding its plant. Included in the program are an 800-foot material storage building to be erected as soon as steel can be delivered; a third floor on the two-story administration building; two additional 1000-foot factory buildings; and tripling size of the foundry of its subsidiary, Northern Foundry Co.

* * *

Index of foundry equipment orders for February, 1941, according to a recent report of the Foundry Equipment Manufacturers Association, Cleveland, was 281.1, as compared with 285.3 in January. Index of orders for new equipment was 295.9, and for repairs, 236.6. The index of 100 represents the monthly average of reported sales to metalworking industries during 1937-38-39.

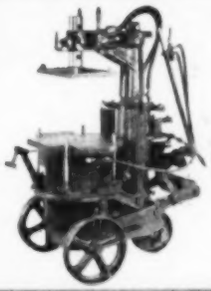
* * *

The pattern storage building of the Barnett Foundry & Machine Co., Lyons avenue, Irvington, N. J., was badly damaged by fire March 12. Herbert L. Edinger, vice president, estimated the loss at more than $1,000,000. He said that practically all the 10,000 wooden patterns in the building were destroyed and that those which were left undoubtedly would be unusable because of water damage. The patterns, he added, were used by companies holding national defense contracts, although the Barnett plant itself had no defense contracts.

RAW MATERIAL PRICES
March 17, 1941

Iron	
No. 2 foundry, Valley	$23 to 24.50
No. 2 Southern Birmingham	20.00
No. 2 foundry, Chicago	24.00
No. 2 foundry, Buffalo	24.00
Basic, Buffalo	23.00
Basic, Valley	$23 to 24.50
Malleable, Chicago	24.00
Malleable, Buffalo	24.50
Charcoal iron, furnace	27.00
Coke	
Connellsville beehive premium	$6.00 to $6.60
Wise county beehive coke	5.50 to 6.50
Detroit by-product delivered	11.50
Scrap	
Heavy melting steel, Valley, No. 2	$20.00 to $20.50
Heavy melting steel, Pittsburgh, No. 2	19.50 to 20.00
Heavy melting steel, Chicago, Auto No. 2	17.00 to 17.50
Stove plate, Buffalo	18.00 to 18.50
Stove plate, Chicago	14.50 to 15.00
No. 1 cast, mchy., New York	20.00
No. 1 cast, mchy., Chicago	22.00 to 22.50
No. 1 cast, Pittsburgh	22.50 to 23.00
No. 1 cast, Eastern Pa.	24.50 to 25.00
No. 1 cast, Birmingham	19.50
Car wheels, iron, Pittsburgh	22.00 to 22.50
Car wheels, iron, Chicago	20.50 to 21.00
Railroad malleable, Chicago	24.00 to 24.50
Malleable, Buffalo	24.00 to 24.50

Nonferrous Metals	**Cents per pound**
Castings copper, refinery	12.25
Straits tin	52.12½
Aluminum, 99 per cent	17.00
Aluminum, No. 12 (Secondary, standard)	19.50
Lead, New York	5.75
Antimony, New York	14.00
Nickel, electro	35.00
Zinc, East St. Louis, Ill	7.25



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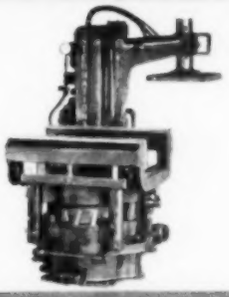

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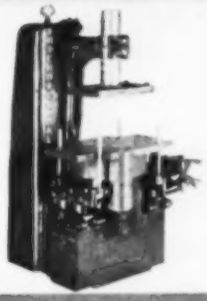

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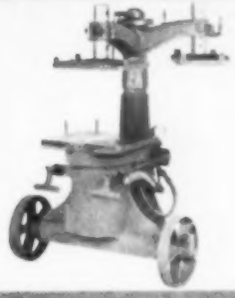

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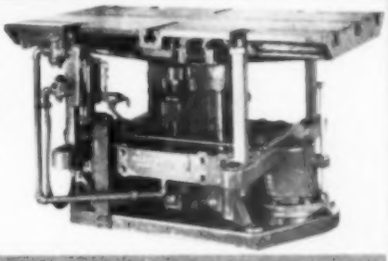

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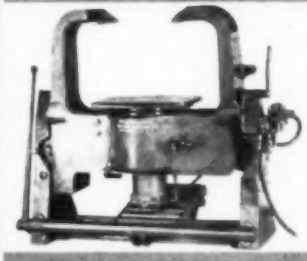

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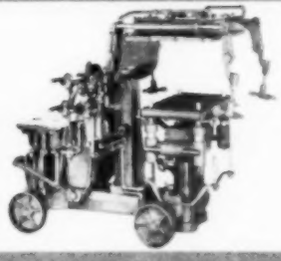

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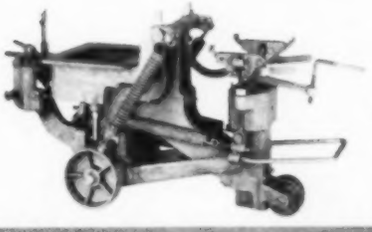

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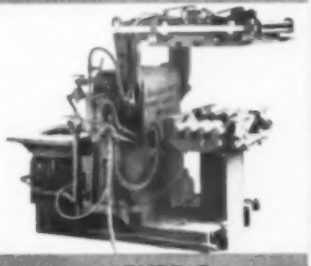

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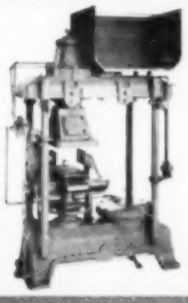

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Western Mich.

DESPITE road conditions making auto traveling hazardous, a group of some 70 members of the American Foundrymen's Association met on March 3 at the Occidental hotel, Muskegon, Mich., to organize formally the Western Michigan group as the twentieth chapter of the association. The meeting was preceded by a dinner with members from Muskegon, Grand Rapids and other nearby towns participating. Don Seyferth, works manager, West Michigan Steel Foundry Co., chairman of the local organizing committee, presided. He presented Robert E. Kennedy, secretary of the A. F. A. who reported on the action of the association's board approving the petition for the chapter formation. Mr. Seyferth then read the report of the nominating committee, presenting the following for election as directors:

A. E. Jacobson, Grand Haven Brass Foundry, Grand Haven; J. W. Livingston, Blackmer Pump Co. Inc., Grand Rapids; C. P. Ziegler, Grand Rapids Foundry, Grand Rapids; Edward W. Beach, Campbell, Wyant & Cannon Foundry Co., Muskegon; F. J. Buckley, Kalamazoo Foundry & Machine Co., Kalamazoo; E. G. Carter, Standard Automotive Parts Co., Muskegon; O. G. Jentsch, Wolverine Brass Works, Grand Rapids; C. M. Clover, Clover Foundry Co., Muskegon; R. J. Teetor, Cadillac Malleable Iron Co., Cadillac; C. J. Lonnee, Muskegon Piston Ring Co., Sparta division, Sparta; G. W. Cannon Jr., Campbell, Wyant & Cannon Foundry Co., South Haven, and J. C. Jensen, Battle Creek Foundry Co., Battle Creek.

Election of those members as directors was approved with the announcement that they later would elect their officers for the coming year. John Abbott, a director of the Chicago Chapter, after conveying the greetings of that group to the newest chapter, presented to Mr. Seyferth a cast iron gavel in the form of a baby rattle. That gavel has been passed from chapter to chapter as new chapters were formed. Mr. Seyferth, in accepting that token, promised that the Western Michigan Chapter was going to be a healthy baby, and show surprising growth. He then read a telegram of greetings from President L. N. Shannon, Birmingham, Ala., and one from E. W. Horlebein, chairman of the former baby chapter, the Chesapeake.

Following those formalities and fun, A. W. Gregg, foundry engineer,

(*Continued on page* 96)

On Feb. 3 foundrymen in Western Michigan met at the Occidental hotel, Muskegon, Mich., as a preliminary to the formal organization of an A.F.A. chapter which occurred on March 3. Photos courtesy of Horace M. Bringhurst, Semet-Solvay Co., Detroit

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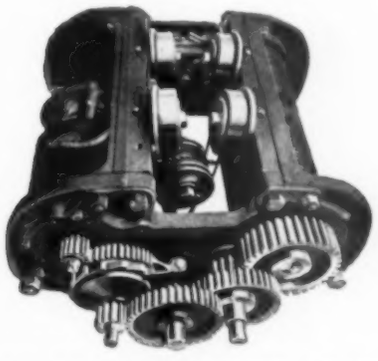

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(*Continued from page* 94)

Whiting Corp., Harvey, Ill., gave an interesting talk on practical cupola operation, showing slides of various types of cupola charging installations. Mr. Gregg in his presentation reviewed several fundamental factors in good cupola practice, stressing the need for constant attention in checking every step in the preparation and charging of the furnace. Next meeting of the chapter will be held Monday, April 7.

Chicago

PRODUCTION of castings can be increased in most foundries through economical application of modern machine molding equipment, asserted W. R. Jennings, foundry superintendent, John Deere Tractor Co., Waterloo, Iowa, in addressing several hundred members of the Chicago Chapter at the Chicago Towers Club, March 10. This holds true, the speaker stated, from both a jobbing and production standpoint.

System advocated by Mr. Jennings is to survey maximum capacity of productive equipment by producing molds by various methods and under different conditions. Information to be obtained is average time for making a given mold by each procedure, number of molds which can be produced in a working day, and quantity of sand handled. With maximum outputs thus determined, it is simply a matter of establishing as standard the procedure which is most productive. He emphasized that technique is often as important as the design and efficiency of machines themselves.

Entertainment prior to the technical meeting was provided by the 20-man glee club of the Continental Roll & Steel Foundry Co., East Chicago, Ind., under the direction of James Thomson, chief plant engineer, who organized it in 1939. Jack Johnstone was accompanist.

Ladies' night party of the chapter will be held at the Chicago Towers Club, April 18.—*E. F. Ross.*

Quad-City

JANUARY meeting of the Quad City Chapter of the A. F. A. was held at the Fort Armstrong Hotel, Rock Island, Ill., Jan. 20, with 55 members present.

Main speaker of the evening was Carl H. Morken, superintendent of operations, Carondelet Foundry Co., St. Louis. Mr. Morken spoke on, "Electric Furnace Cast Iron." The various types of work that could be done with this furnace were explained and the operation in order to secure irons calling for certain specifications discussed. With the use of slides Mr. Morken showed various types of castings, both large and small, gave data as to their properties and construction, and the advantages of using electric furnaces in foundries doing similar work in the industry. Many practical shop illustrations were given as to the methods followed in molding and pattern work. The discussion of practices carried on proved to be very interesting and practical and the group had many questions to ask relating to their problems.

The American Society for Metals of the Tri-Cities held a joint meeting with the Quad-City Chapter of the A. F. A. at the Fort Armstrong Hotel, Rock Island, Ill., in February. There were 125 present for the dinner and John D. Graham, chairman of the Tri-City chapter of A. S. M. presided. The technical session was opened by a coffee talk by Brig. Gen. Norman F. Ramsey, commanding office of Rock Island Arsenal who talked on the operations carried on at the present time at that plant. Manufacturing methods and products made during this time of defense were discussed for those in attendance.

Main speaker was Garnet P. Phillips, metallurgist, International Harvester Co., Chicago, who discussed the subject of, "Automotive Castings." The various types of castings used in that field were mentioned, alloying of castings, the heat treatment and testing necessary before placing them in the completed stage.—*J. Morgan Johnson, secretary-treasurer.*

S. California

FORMER chairman of the Southern California Chapter, A. G. Zima, International Nickel Co., discussed "Development of Modern Alloyed Cast Irons" at the chapter's Feb. 27 meeting held at the Los Angeles Elks Club. Approximately 100 members and guests were present and James Eppley, chapter chairman presided. Robert Gregg, chairman of the Foundry Day program to be held in conjunction with the Western Metal Congress, Los Angeles, May 19 to 23, reported that six Eastern speakers were to address that regional meeting. The sessions would be held Thursday and Friday mornings with a banquet and more speakers Friday evening. All Pacific Coast foundrymen are invited to attend the meeting.

Mr. Zima's talk dealt chiefly with a review of the functions of various elements entering into the composition of cast irons. The alloying elements were classified into two groups, namely: The graphitizers, and the carbide formers and discussed each one briefly. These alloys are added to cast irons either singly or in combination to obtain one or all of the following dominating characteristics: Production efficiency; better mechanical properties; heat and corrosion resistance; special electrical and magnetic properties; specific expansion characteristics. Mr. Zima emphasized that composition alone is not a criterion for evaluating the properties or usefulness of cast iron, but that certain inherent characteristics are imparted to the material by melting and pouring practice, ladle inoculation, etc. This was illustrated by data comparing irons of almost identical composition but possessing widely divergent mechanical properties. The talk was illustrated with a number of slides showing fundamental effects of the various elements upon the properties of cast iron, together with several illustrations of typical applications of modern cast irons.—*W. F. Haggman, secretary.*

Metropolitan

EMPHASIZING the importance of steel castings in the national defense program, James J. Curran, chief metallurgist, Walworth Co., Greensburg, Pa., discussed the problem of producing good, sound castings at reasonable costs before the Metropolitan Chapter of the A.F.A. at the Essex House, Newark, N. J., Feb. 5. He covered various phases of both alloy and plain steel casting production and testing, with particular stress on pressure work. Mr. Curran also commented on progress in design and radiographic research and emphasized the practical value of United States Navy gamma ray standards. A feature was the presentation of a sound film on the production of steel castings, presented through the co-operation of the Steel Founders' Society of America. —*B. K. Price.*

Capitalizing on the opportunity to give a *long talk*, Henry S. Washburn, president, Plainville Castings Co., Plainville, Conn. discussed before some 60 members and guests of the Metropolitan Chapter on March 5, the method he has found successful in profitably supplying customers with low cost, quality castings.

Introduced by D. J. Reese, International Nickel Co., New York, Mr. Washburn opened his talk by pointing out that in a jobbing foundry the product is usually shipped unfinished, and hence the production and sale of castings must be considered jointly. To be able to carry on a profitable business the foundry-

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man must first have an analysis of his costs. This analysis includes such factors as the history of labor and materials and the level of foundry activity. Although the cost of labor and material might remain the same, the cost of castings may vary because of the level of foundry activity.

Mr. Washburn stated that it has been his experience that the best method of insuring satisfactory relations with the buyer of castings is to approach the customer with a policy such as the following: Show him your costs, figure a reasonable profit and then explain that future increases or decreases in the price of the castings will depend upon variation in the cost of labor and raw materials and upon how closely the activity in the foundry approaches the 65 to 70 per cent level. The benefits to the customer of this plan, he said, are an improvement in the quality of the castings and a reduction in net costs over a period of several years. Mr. Washburn concluded his well received talk with a plea for foundrymen to continue to improve the position of their industry by availing themselves of the technical benefits offered by such organizations as the American Foundrymen's Association.

Previous to the technical talk and discussion the assemblage enjoyed many a hearty laugh and chuckle listening to a coffee talk given by A. W. Deller, patent attorney for International Nickel Co., New York, who described with illustrations various patents which ranged from icicle shooters to shovels designed to accommodate tired laborers.

Chairman R. J. Allen, Worthington Pump & Machinery Corp., Harrison, N. J., announced that Vinton Higbe, Atlantic Casting & Engineering Co., Clifton, N. J., will speak at the April 9 meeting of the Metropolitan Chapter. His subject will be, "Plaster Molds for Precision Nonferrous Castings."—*K. A. DeLonge.*

Cincinnati

INSPECTION of the blast furnaces and coke oven at the Hamilton plant of the American Rolling Mill Co. featured the March 11 meeting of the Cincinnati District Chapter. The plant inspection was preceded by a dinner at Shuller's restaurant, Cincinnati at which H. F. McFarlin, Lunkenheimer Co., and chairman of the chapter presided. Sixty members participated in the tour.

William Romanoff, technical superintendent, H. Kramer & Co., Chicago, will discuss, "Brass Foundry Practice" at the April 8 meeting of the chapter.—*Henry M. Wood, secretary.*

New Jersey

CLEANING Room Equipment and Methods was discussed before 120 members of the New Jersey Foundrymen's Association at its meeting held Feb. 24 at Newark, N. J. Carl Carlson, sales engineer, Norton Co., said wheel specification depended on: Material to be ground; amount of stock to be removed; accuracy and finish required; area of contact; and type of machine. Grade of wheel is important, and manufacturers' recommendations should be followed. Economy with a given wheel depends on speed and pressure.

Speed is limited by safety, but maximum speed permissible should be used and maintained by cone

Approximately 90 foundrymen attended a meeting at Toledo, O., sponsored by the A.F.A. and a local committee headed by D. E. Hensley, Southern Wheel division, American Brake Shoe & Foundry Co., Toledo. Photos courtesy of Sterling Farmer, Sand Products Corp., Cleveland

pulley or transfer of wheel to higher speed machine as wheel wears down. Pressure is limited by fatigue of operator, danger of wheel breakage, and work requirements; but within these limits increased pressure gives positive gain in economy, whereas faster cutting by using softer wheel may or may not improve economy. Portable grinders and specially shaped wheels are being used more and more extensively.

Fred Mosley, foundry engineer, Whitehead Bros Co., speaking on blast cleaning said high pressures were often less economical than low pressures because: Reduction in time is not proportional to increase in horsepower; if certain pressure gives satisfactory finish, higher pressure is not necessary; abrasive life is shorter; wear is greater; low pressure and larger nozzle gives greater volume of abrasive.

James Rigby, Eastern sales manager, American Foundry Equipment Co., claimed that blasting in one of the machines supplied by his organization costs only about half as much as in a room. Where part of the work is fragile, a combined blasting and table machine with a common separator and dust system often is economical in moderate sized brass foundries. Also smaller sized cleaning machines with rubber aprons can clean a variety of work without breakage. For steel foundries, a machine of specially heavy construction will handle rather heavy castings. A sandblast room should not necessarily be designed to handle the largest castings made, since this would mean excessive cost for ventilating equipment and operation.

A. B. Eastwood, Tabor Mfg. Co., stated that the use of the abrasive cutting machine for cutting off gates and risers was spreading rapidly among nonferrous foundries, and claimed savings often were sufficient to pay for the machine in 6 months. It is also used in steel foundries to an increasing extent. One advantage over torch cutting is that the cut is closer and requires less grinding to be done later.—*John L. Carter, secretary.*

Philadelphia

ANOTHER large gathering turned out for the meeting of the Philadelphia Chapter of the A. F. A held Friday, Feb. 14 at the Engineers Club. Dinner was served earlier to permit more time for the after dinner speaker, Melvin Whiteleather, a foreign correspondent who just recently was made associate editor of the *Philadelphia Evening Bulletin*. Mr. Whiteleather spent many years abroad and knew intimately the leaders of the warring nations. It is always of great interest to listen to a good American tell of his experiences abroad, especially one who just has returned from war-torn Europe and knows so much of the inside politics of those countries involved in the present war.

John N. Ludwig Jr., metallurgist, Electro Metallurgical Co., New York, presented a paper on "Ferroalloys in the Control of Metallurgical Properties of Cast Iron". He was introduced by Allan Van Wye, Olney Foundry division, Link-Belt Co., Philadelphia, who served as technical chairman. Mr. Ludwig approached his subject from the angle of carbon control, showing where safety deoxidation through ferroalloys and briquets was influential in producing a desirable graphite type in the iron as well as in regulating its quantity and distribution. The talk was illustrated with slides and he showed samples of excellent physical properties obtained in commercial production with ladle additions of ferrosilicon and the more recently developed SMZ and CMSZ types of ferroalloys. This paper was ably presented and much interest was shown by the members in the question period and discussion that followed.

Chairman Roger Keeley announced the following to serve on the nominating committee: W. C. Hartman, chairman, C. E. Schley, W. T. Yost.—*J. T. Fegley, chairman, publicity committee.*

Central New York

AN OFFICIAL visit by President Lester N. Shannon and Assistant Secretary Norman F. Hindle of the American Foundrymen's Association featured the regular meeting of the Central New York Chapter of the A. F. A. held at the Onondaga Hotel, Syracuse, Feb. 14. Frank Wheeler, chapter chairman, expressed the appreciation of the foundrymen of Central New York in having an opportunity to greet President Shannon and Assistant Secretary Hindle on their home grounds. Approximately 75 Central New York foundrymen were present to greet the officers from the central body. Chairman Wheeler introduced Norman F. Hindle who made a few appropriate remarks and then introduced President Shannon to the foundrymen.

President Shannon stated that he felt that the American Foundrymen's Association was making a definite contribution to the foundry industry, to which the foundrymen present heartily agreed. He also stated that the chapters of the A. F. A. had their start from the regional meetings which were held in different parts of the country and he hoped that by the end of the fiscal year there would be at least 5000 members in the association.

Harold H. Judson, foundry superintendent, Goulds Pumps, Inc., discussed, "Gates and Risers." Mr. Judson stated that one of the most important phases of gating is the location of the gate with relation to the castings. For some types of nonferrous work certain foundrymen gate through the risers. From observation at the Goulds Pump plant, they found that they were more successful with flat jobs when poured fast. In some cases the blacking will flake off the cope if not poured fast enough.

V. L. Whitehead Jr., treasurer and Robert K. Glass, vice chairman of the Western New York chapter of the A. F. A.; and Frank G. Steinebach, editor of THE FOUNDRY were present. Robert Glass assisted during the discussion period. It was noted that Mr. Glass was the first principal speaker at the first meeting of the chapter two years previous.—*L. D. Wright, secretary.*

N.E. Ohio

APPROXIMATELY 125 members attended the meeting of the Northeastern Ohio Chapter held March 13 at the Tudor Arms, Cleveland where President Ray Fleig, Smith Facing & Supply Co., urged renewed activity of the membership committee. J. G. Goldie, foundry instructor, Cleveland Trade School presented a progress report on the annual apprenticeship contest in molding and pattern making. R. Louis Towne, Surface Combustion Co., Toledo, told many amusing anecdotes to illustrate points in an address on the importance of cultivating certain mental attitudes. Technical paper *Sand Control as Practiced in a Malleable Foundry* was presented by Elmer C. Zirzow, National Malleable & Steel Castings Co., Cleveland. Illustrated by several slides the paper covered the methods of sand control as practiced at the plant with which he is connected.

Discussing control methods Mr. Zirzow presented charts showing comparisons between various types of sand in grain fineness, fines, moisture, bond, sea coal additions and the use of fuel oil. He claimed that the addition of a certain amount of fuel oil increased the workability of the sand and was reflected in the improved appearance of the castings. In an extended discussion of core sand control he considered fineness, green permeability, green bond strength, dry bond strength, baking control and the results of variations

(*Continued on page* 102)

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(*Continued from page* 100)

in control methods and sand mixtures. Summing up in conclusion he claimed that with the increasingly greater demand for better castings and the increasing number of centrally located sand systems, sand control in any foundry has become an absolute necessity. Accuracy of sand control is dependent to a great extent upon the sand handling equipment. Amount of control depends on the variety of castings which are produced.—*Pat Dwyer.*

Nor. Iowa

ONE hundred and twenty-one members and guests attended the Feb. 25 meeting of the Northern Iowa Foundrymen's Association held in Black's Tea Room. The meeting was presided over by President Carl Gosline, who introduced the speaker of the evening, M. A. Fraher, engineering superintendent, John Deere Tractor Co. Mr. Fraher's talk on "Gray Iron Castings from an Engineering Viewpoint," pointed out the problems placed before the designing engineer by the foundry and machining departments, and also showed why certain parts, difficult to cast, had to be so designed.

Mr. Fraher brought out the two main factors that influence the designing engineer. First, the part must be so designed that it will become profitable to the user, and in this connection it was mentioned

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One of the high spots of the Feb. 13 meeting of the Northeastern Ohio Chapter was the presentation of plaques to firms which had winners in the A.F.A. apprenticeship contest. Photos courtesy of Sterling Farmer, Sand Products Corp., Cleveland

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(*Concluded from page* 102)

that reducing the price made possible the wider utilization of a product. Second, the proper material must be selected for a part on the bases of strength, weight, ease of machining and appearance. In discussing this latter point, Mr. Fraher brought out the necessity for careful control through all foundry operations and the continual checking of all castings. Interesting figures regarding the effect of varying section size on strength and rigidity were presented. In closing, Mr. Fraher stated that the close co-operation between the foundry and the engineering department, and the vast improvement in foundry technique, had made the job of the designing engineer much easier.—*F. R. Snyder, secretary.*

N. California

ALTHOUGH not exactly a Valentine party, regular meeting of the Northern California Chapter of the A. F. A. was held Feb. 14, one of those rainy nights when all like to be cozy at home. The program as announced was the drawing card with no follow up and no phone calls. Members just would not stay away—in fact 10 extra plates were set for those who forgot to send in their reservations. There were 59 present, 36 of whom were men from the shops and who came to learn.

After dinner the group divided into three sections to discuss sand as it applies to iron, nonferrous and steel practice. One group did not adjourn until 11:15. The meeting was in charge of Chairman Ivan L. Johnson who was assisted by Clarence Henderson, dean of the chapter. Program chairman, James L. Francis was responsible for showing a U. S. Bureau of Mines movie, "Oil Lands of Europe and Africa." Ben C. Page, James Scott and Ray Wilson were in charge of the discussion groups.—*George L. Kennard, secretary-treasurer.*

Pittsburgh

CONSIDERABLE discussion highlighted the regular February meeting of the Pittsburgh Foundrymen's association held at Fort Pitt hotel, Pittsburgh, Feb. 17. Ladle additions and their effect on hardness and machinability of castings were discussed by R. G. McElwee, Vanadium Corp. of America, Detroit. Mr. McElwee's talk covered the subject of adding various alloys to the ladle in an attempt to control hardness and maintain machinability in castings. Particular emphasis was laid on late additions.

In the case of most of these additions, results are obtained in the initial addition of small quantities through the throwing out of carbon to provide graphitization of the melt and thus results in a softening effect. Actually the silicon contained in many of these additions hardens the ferrite.

Physical requirements of a good addition include a definite physical form; chemical action which will include catalysis as well as acceleration; sufficient specific gravity to sink in the melt and combine with the iron in the ladle. In addition to this, the by-products of the reaction must be harmless. The speaker showed numerous slides of the physical effects of addition of these alloys to the composition of the melt.

Discussion of the various points involved, particularly on the time and temperature at which additions should be made, was quite active.

Program committee announced the speaker for the April meeting will be Earl J. Bush of the Washington Navy yard, who will speak on some aspects of the nonferrous foundry problem in connection with the national defense program.

At the May meeting, which will be devoted to apprentice work, James G. Goldie, of the Cleveland Trade school and national chairman of the A. F. A. apprentice training committee, will be the principal speaker.—*R. L. Hartford.*

Reading

BECAUSE of the importance and interest in the subject which Major W. S. Broberg, U. S. Ordnance Department, Procurement Division, Philadelphia, discussed, members of the Manufacturers Association of Berks County were invited to attend the Jan. 21 meeting of the Reading Foundrymen's Association held at the Berkshire hotel, Reading. Major Broberg told those present of the tremendous volume of orders already placed or being placed for national defense operations. He emphasized that owners or operators of plants desiring government orders should contact the procurement division of the department.

Lieut. W. H. Byers, Philadelphia, described in detail the functions of the procurement division in placing orders and handling materials for the ordnance department. Another speaker, Edward Wyatt, Labor Division of the U. S. Defense Commission told of the work of training unskilled and semiskilled men for service as skilled men in plants working on government orders.

H. C. Cummings, secretary of both the foundrymen's and the manufacturers' organizations reported that a complete schedule of all machinery and tools available in Reading and Berks county for work on government work has been completed.

Monthly meeting of the Reading Foundrymen's Association was held at the Berkshire hotel, Reading, Pa. Feb. 18 with President H. P. Good presiding. Speaker of the evening was G. S. Evans, metallurgist, Mathieson Alkali Works, New York, who talked on, "Cupola Research." Mr. Evans gave an interesting discussion of the proper way to operate a cupola and described in detail the plans of the American Foundrymen's Association to explore those problems further. The subject was greatly appreciated by the 85 members present and many questions were asked.

The following committees were appointed: Speakers' committee, J. M. Robb Jr., chairman, Herman Mandel; membership committee, C. H. Mundell, chairman, R. B. Harrison, H. G. Stults, B. S. Reed, J. Hatten; entertainment committee, H. P. Good, chairman, C. L. Bates, L. E. Bilger, M. G. Moore, William M. Davies; auditing committee, S. J. Wagner, E. K. Mark, J. S. Hinkley.—*H. C. Cummings, secretary.*

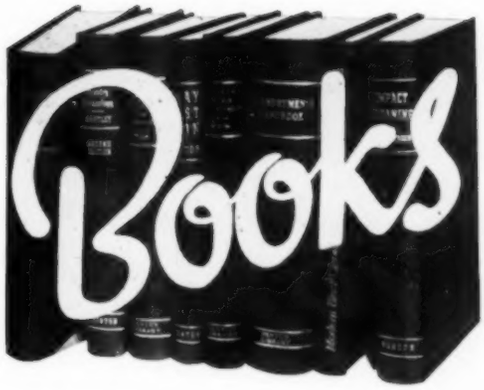
New England

REGULAR meeting of the New England Foundrymen's Association was held Feb. 12 at the Engineers Club, Boston, with the newly elected president of the association, Charles O. Butler, presiding. A. S. Wright, Hunt-Spiller Mfg. Corp., chairman of the fifth New England regional foundry conference outlined the program to be presented at the conference.

Prof. Peter E. Kyle, Department of Mechanical Engineering, Massachusetts Institute of Technology, Cambridge, Mass., spoke on "Development in Precision Casting Processes."

Professor Kyle divided his talk into three parts: Permanent molds; die castings; plastic molds. Although he referred mainly to nonferrous castings, he said that there was at present active research being conducted in the development of die casting of cast irons. Zinc base materials are most suitable for die castings because they give longer die life; can be cast at lower temperature; and are cheap. Usual pressures employed in die casting are 25 to 30 pounds, although pressures up to 300 pounds have been used. Extremely thin castings may be made by this process and in many instances, threads on castings are used as cast without further machining. Also, inserts may be used when necessary. —*Merton A. Hosmer.*

Foundry Books of Value



1 GRAY CAST IRON, by John W. Bolton. Includes most recent information and data on structural metallurgy; engineering and physical properties; melting processes; casting defects; effects of regular and alloying elements; superheating; heat treatment; machinability and wear; effect of temperature on mechanical properties; corrosion; and specifications. 383 pages, fully illustrated. $5* postpaid.

2 ELEMENTARY FOUNDRY TECHNOLOGY, by L. A. Hartley. Second Edition. Written especially for practical use in foundries and for instruction of apprentices. Includes elementary chemical and physical data, effects of elements on iron, iron manufacture, elementary problems in steel foundry production, brass melting, foundry sands, molding machines, and data on gates and risers. 377 pages, 132 illustrations. $3* postpaid.

3 GATES AND RISERS FOR CASTINGS, by Pat Dwyer. A practical book covering sound foundry practice. The only book available discussing the important question of "How can casting defects be prevented". 373 pages, illustrated. $3* postpaid.

4 MELTING IRON IN THE CUPOLA, by J. E. Hurst. Covers practically every phase of cupola construction, operation and maintenance in a usable manner. Tables, formulas and a complete cross-index listing more than one thousand items makes this an ideal reference book for novice and experienced foundrymen. 240 pages, 126 illustrations. Formerly $5—NOW $2* postpaid.

5 REFINING METALS ELECTRICALLY, by L. J. Barton. Covers theory and practice of melting in the electric furnace. Gives information on furnace selection, type and operation. A fully practical book. 414 pages, 55 illustrations, 50 tables. Formerly $6—NOW $2* postpaid.

6 AMERICAN MALLEABLE CAST IRON, by H. A. Schwartz. Covers history of the industry, its developments, methods of manufacture, metallurgical principles involved and the properties and uses of malleable cast iron. Useful to producers, users and students. 416 pages, 190 illustrations. Formerly $5—NOW $2.50* postpaid.

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11 INVENTIONS AND THEIR PROTECTION, by George V. Woodling. A readable book on the subject of patent protection, written by an engineer-patent attorney especially for men in industry. This book tells all that is necessary for laymen to know to protect their patentable ideas. It is really "patent law complete in one volume". 316 pages, 47 illustrations, 223 topical headings. $5* postpaid.

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Foundry Instructor
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SINCE the greater part of the information on machine molding is imparted orally or by demonstration, the written text on this phase of foundry practice is brief. The first part as in former instances deals with various type jobs, practical work, operations and technical features. The second part is a typical question sheet and oral test:

Type No. 1, power squeezer. Rigging-cope, drag and plate. Making molds from a pattern. Squeezing cope and drag. Molding machines and production methods.

Type No. 2. Jolt squeezer. Jolting drag and squeezing cope. Same as type No. 1. Theory of jolting.

Type No. 3. Split pattern. Jolt and squeeze drag. Ramming drag. Matching cope and drag and No. 1 and 2. Principle of conveyor systems.

Type No. 4. Combination jolt-roll-over squeeze and stripper plate. Rigging machine patterns and flask and making molds from separate cope and drag. Same as 1, 2 and 3. Sand slingers and new developments in machines.

Oral Test on Unit No. 3, machine molding consists of the following questions on that type of operation:

1. What is a match plate?
2. What is a vibrator?
3. Can a mold be squeezed too soft?
4. What type of job requires a jolt machine?
5. What is a roll-over machine?
6. Why do we use snap or slip flasks on squeeze machines?
7. Do you ever squeeze the drag and cope at the same time?
8. Why do you use the shovel handle to ram round the edge of the flask?
9. What are the main difficulties in running a jolt squeezer?
10. What is a squeeze board?
11. What is a stripper machine?
12. What will happen if the mold is jolted too much?
13. In squeezing cope and drag at same time, where should the squeeze board fit?
14. What is a match part?
15. What type of patterns are used in match parts?

In the following typical written examination the student is expected to fill the blank space on each line with the proper word:

1. A machine that packs the sand by pressing the sand into position is called a ..... machine.
2. Machines that turn the mold over are called ..... machines.
3. Packing the sand by bumping is termed .....
4. Vibrators are used to ..... the .....
5. The board that fits on the cope side of the mold is called a ..... board.
6. The board that the mold rests on in position for pouring is called a ..... board.
7. A plate with the pattern cast on to it is called a ..... plate.
8. Too strong or too long vibration will cause a ..... in the casting.
9. Machine molding is carried on mostly in ..... foundries.
10. The flask and plates should always fit ..... on the pins of the .....

Unit No. 4 is devoted to the subject of coremaking arranged in the same order as the preceding units:

Type No. 1. Flat cores. Tempering sand, cleaning core boxes. Cover cores, skim cores. Wire straightening, ramming cores, baking cores, and cleaning cores. Requirements of a core. Sand requirements for different cores. Binders. Baking temperatures. Sand ratios.

Type No. 2. Round stock cores. Ramming, rodding, venting, standing cores on end, rolling cores out of box, using dump box, and core dryers. Necessity of venting, and core dryers.

Type No. 3. Cover from dump boxes. Same as Nos. 1 and 2. Setting lifters, baking, and blackening. Reasons for using dump boxes. Strength of lifters. Reasons for blackening.

Type No. 4. Cores from split boxes and loose. Same as Nos. 1, 2 and 3. Using dogs and clamps. Pasting and finishing. Core binders, core mixtures for different classes of castings, and oven control.

Following are typical of the questions that might be asked the trainee after his instruction period on coremaking:

1. What sands are used for cores?
2. What is used for binder?
3. Why are binders used in core sand?
4. How should core sand be mixed?
5. If too little binder is used what will be the results?
6. By what means are cores shaped?
7. Of what material are core boxes made?
8. How are cores reinforced?
9. How are cores vented?
10. Why are lifting hooks put in cores?
11. Name three methods used to support cores on plates.
12. At about what temperature should cores be baked?
13. If cores are baked too much what is the effect?
14. If cores are baked too little what is the effect?
15. What happens when core sand is too dry?
16. What happens when core sand is too wet?

The true or false test on a select-

Recommended Record of Trainee Grades

(Front)

Name Race

Address

City

Age Height Weight Married

Single School Year Completed

Previous Experience

Jobs Held Previous to W.P.A.

1. How Long?

2. How Long?

3. How Long?

Foundry Experience

Name of company

What type of work did you do?

(Back)

Date	Station	Type Jobs	Hrs.	Grade Remarks

Instructor Date

ed list of statements indicates in a general way to what extent the trainee has absorbed instruction:

1. (T F) Silica sands of high clay content are used for making cores.
2. (T F) Cores can be made from green sand or dry sand.
3. (T F) Cores do not require to be vented.
4. (T F) A coarse sharp sand held together by a binder that forms a solid mass makes the best core.
5. (T F) Cores are located in the mold by core prints.
6. (T F) Core sand has no natural bond.
7. (T F) Core sand has bond and cohesion while molding sand has none.
8. (T F) The larger the core, the coarser the sand must be.
9. (T F) Cores should be baked at an even temperature.
10. (T F) Linseed oil is the base of all core oils.
11. What is used to harden cores?.....
12. Are vents used in all cores?.....
13. By what means are cores shaped?....
14. Are all cores made by hand?.....
15. Name two binders used in core sand. .....
16. The plate used to support a core is called a ..... plate.
17. Are plates used to support all cores?
18. Coreboxes always should be ..... after using.

After the castings are shaken out of the molds the feeders, gates and runners are broken off with a hammer, sawed, cut off with a torch, or sheared, depending upon the size and shape of the casting and the metal of which it is composed. In the next operation the casting is chipped and cleaned and finished on a grinding wheel. The grinding wheel removes all riser and gate stumps, chill marks, fins, parting lines, slight lumps and burrs and any other surface imperfections.

When installing a grinding wheel on a stand the wheel should be inspected properly by sounding and sight before and after installation. The wheel should not be run at a speed greater than that recommended by the manufacturer. The wheel should be adjusted on the shaft with a sliding fit. The flanges on either side should be the same size and properly relieved. The tightening nut should be drawn up snug, but not too tight. Always run the wheel for approximately 1 minute before commencing to grind the castings. Never stand in front of a wheel during the testing period. Make sure that the dust collecting system is in proper operating condition. This is an important factor in keeping the wheel cool.

Unit No. 5 concerned with grinding, chipping, cleaning, inspection and shipping is as follows:

Grinding is the term employed in the removal of gates, feeder and riser mouths, core fins, parting lines and slight imperfections such as lumps and burrs with abrasive wheels.

Chipping with hand electric or pneumatically operated chisels applies to the removal of gates, feeder and riser mouths, core fins, parting lines and slight imperfections such as lumps and burrs. Chipping usually replaces grinding only when the material to be removed is in such a position that a grinding wheel cannot reach it.

Cleaning applies to the removal of all sand and scale by buffing, sand or shot blast, pickling or tumbling barrel.

Inspection is a necessary check for any defects whether dimensional or casting flaws that would render the castings commercially unfit.

Shipping covers the final plant destination for all materials that are ready to be sent to the purchaser. Here all material is billed and then delivered to the customer.

The following are typical of the questions that might be asked the trainee in testing his knowledge of Unit No. 5, grinding, chipping and inspection:

1. What is a grinding wheel?
2. How is a grinding wheel used?
3. Why should a grinding wheel be tested before being used?
4. How do you test a grinding wheel?
5. What is a swing frame grinder?
6. What is meant by cleaning castings?
7. How does a sand blast operate?
8. What is a dust arrester?
9. Why is it necessary to have a dust arrester?
10. What safety precautions should be taken in operating a sand blast?
11. What is the inspection dept.?
12. What is a tumbling barrel?
13. How should tumbling material be packed?
14. Why is it necessary to use gages in the inspection department?

In a question sheet on the same subject, two or three line spaces are provided after each question for written answers.

1. Name three types of grinding wheels?
2. Name two types of chipping hammers?
3. Why are some castings chipped instead of ground?

(*Continued on page* 122)

State Employment Office Record For Employer

Trainee Address

Registered in the National Defense Foundry Training Program at School

No. of hours From To

Bench Molding	Floor Molding	Machine Molding	Coremaking	Cleaning	Melting
Even parting jobs	Even parting jobs	Plain squeezer	Sand mixing	Tumbling barrel	Chipping cupola
Even parting green sand core jobs	Even parting green sand core	Simple jolt squeeze jobs	Pasting Cleaning	Sand blast barrel	Weighing charges
Even parting dry-sand core jobs	Even parting dry-sand core jobs	Drag roll-over	Oven tending	Cabinet sand blast	Charging
Simple un-even parting jobs	Simple un-even parting jobs	Cope roll-over	Dump boxes	Grinding	Ladle tending
Difficult un-even parting jobs	Difficult un-even parting jobs	Combination jolt-squeezer roll-over	Flat cores	Chipping	Non-ferrous furnace tending
Split pattern jobs	Split pattern jobs	Bumper Machine stripper	Stock cores	Inspecting and shipping	
Gated pattern jobs	Cope and drag jobs		Split core boxes		
Match making	Molder-Helper		Cores using dryers		
Pouring	Pouring				

Remarks

Instructor

Key: F—Fair G—Good V.G.—Very Good

Compositions and Characteristics of Magnesium Sand Castings

Alloy	A.S.T.M. Alloy No.	Aluminum Per Cent	Manganese Per Cent	Zinc Per Cent	Silicon Per Cent	Other[1] Impur. Max. Per Cent	Manganesium Per Cent	Characteristics and Uses
Dowmetal C	17	8.3-9.7	0.10 min.	1.7-2.3	0.5 max.	0.3	Remainder	For castings requiring moderate strength
								For castings requiring high strength and best toughness
								For castings requiring high yield strength and hardness
								As cast
								Heat treated—HT
								Heat treated and aged—HTA
Dowmetal H	4	5.3-6.7	0.15 min.	2.5-3.5	0.5 max.	0.3	Remainder	For castings requiring moderate strength and toughness
								For castings requiring high strength and best toughness
								For castings requiring high yield strength and hardness and moderate toughness
								As cast
								Heat treated—HT
								Heat treated and aged—HTA

[1] Copper, max. 0.05 per cent. Nickel, max. 0.03 per cent.
Note: Dowmetal C is used for maximum pressure tightness.
Dowmetal H is used for best salt water resistance.

Mechanical Properties of Magnesium Sand Castings

Alloy	Condition	Tensile Strength lb./sq. in. Specified Minimum	Tensile Strength lb./sq. in. Typical	Yield Strength lb./sq. in. Specified Minimum	Elong. in 2 in. Per Cent Typical	Elong. in 2 in. Per Cent Specified Minimum	Compressive Strength lb./sq. in.	Shear Strength lb./sq. in.	Rockwell E Hardness	Brinell Hardness	Impact Izod ft.-lb.	Fatigue Endurance Limit lb./sq. in.
Dowmetal C	As cast	20,000	24,000	10,000	2	1	51,000	.....	68	60	1	11,000
	Heat treated	30,000	39,000	14,000	10	6	52,000	.....	66	59	4	11,000
	Heat treated and aged	32,000	39,000	21,000	3	1	58,000	.....	85	77	1	11,000
Dowmetal H	As cast	24,000	27,000	12,000	5	4	45,000	16,000	59	55	3	10,000
	Heat treated	30,000	38,000	12,000	11	6	46,000	16,000	60	55	5	10,000
	Heat treated and aged	32,000	38,000	19,000	5	2	50,000	18,000	74	70	2	10,000

Yield strength is defined as the stress at which the stress-strain curve deviates 0.2% from the modulus line.
Fatigue endurance values are obtained on R. R. Moore machines and are based on 500 million cycles.

MAGNESIUM SAND CASTINGS

(*Continued from page* 44)

metal is hand dipped in ladles holding up to 25 pounds.

The present use of this method of melting is limited to the production of small castings and to cleaning up and reclaiming scrap. It has been described in detail by Gann and Brooks *Transactions* of the American Foundrymen's Association, Vol. 43, p. 591-614, 1935). The crucible method using individual melts is used much more generally, as it is more adaptable to the pouring of large castings and to the usual foundry production methods.

The crucibles ordinarily are made of carbon steel, preferably of *firebox* grade. These are used without lining as iron is almost insoluble in molten magnesium, even at 1600 degrees Fahr. The crucibles in current use range from 60 to 600 pounds in capacity and are heated in oil or gas-fired furnaces. Up to a total weight of about 200 pounds (120 pounds of magnesium alloy) the crucibles are carried to the molds manually or on small buggies. Above that weight, monorail conveyors and cranes are used to transport the metal from furnace to mold.

Crucible Settings are Cleaned

It is desirable that the furnace design and the combustion control be such as to minimize the scaling on the outside of the crucibles. Crucible settings are cleaned daily to insure that no accumulation of oxide occurs. If molten magnesium from a leaking crucible comes in contact with hot iron scale, a violent reaction of the thermit type may result. The crucibles are examined frequently, at least every 8 hours, and are discarded if thin spots are indicated by hammering. This scaling is the usual cause of crucible failure, and in the interest of economy and safety, consideration is or should be given in every foundry to methods of controlling it.

Nonscaling stainless steels containing considerable nickel cannot be used for crucible construction because of the resulting contamination of the melt with nickel. High chrome iron (28 per cent Cr) has been used to some extent and is satisfactory from the scaling standpoint. In the absence of scaling, mechanical distortion and weld cracking due to prolonged exposure to high temperatures govern the useful life of the crucible. At the

moment, the cost of the high chrome iron crucibles does not appear to be justified.

Data are not available on the performance of chrome irons with lesser amounts of chromium or on carbon steels clad with nonscaling material on the exterior. While not a factor with ordinary steel crucibles, there is some indication that pitting or corrosion on the interior by melting fluxes may affect the performance of long life crucibles. Silicon carbide crucibles can be used but are not handled as conveniently as the steel crucibles. They are necessary, however, if it is desired to cast magnesium alloys with less than 0.020 per cent iron contamination. Clay or clay-bonded refractory crucibles should not be used because of attack by molten magnesium and fluxes employed in melting.

At present, the most practical solution of the scaling problem appears to be the use of carbon steel crucibles with the outer surface calorized or aluminum-sprayed, sealed and annealed by the metcoseal process or its equivalent. Satisfactory results also have been obtained by dipping freshly sandblasted steel crucibles in molten aluminum for 20 minutes at 1500 degrees Fahr. Crucibles coated with aluminum by any of these processes do not scale but are discarded after 250 to 300 heats because of distortion, and thus give three to four times the life of ordinary steel crucibles.

Use a Special Flux

In the crucible method of melting, protection of the magnesium alloy from oxidation is by the use of a special flux (Dow flux No. 31) which is fluid when first melted but which becomes dry and crusty after brief exposure to high temperatures. In melting down, the usual procedure is as follows: A light sprinkle of flux is placed in the crucible which then is charged with ingot and scrap metal.

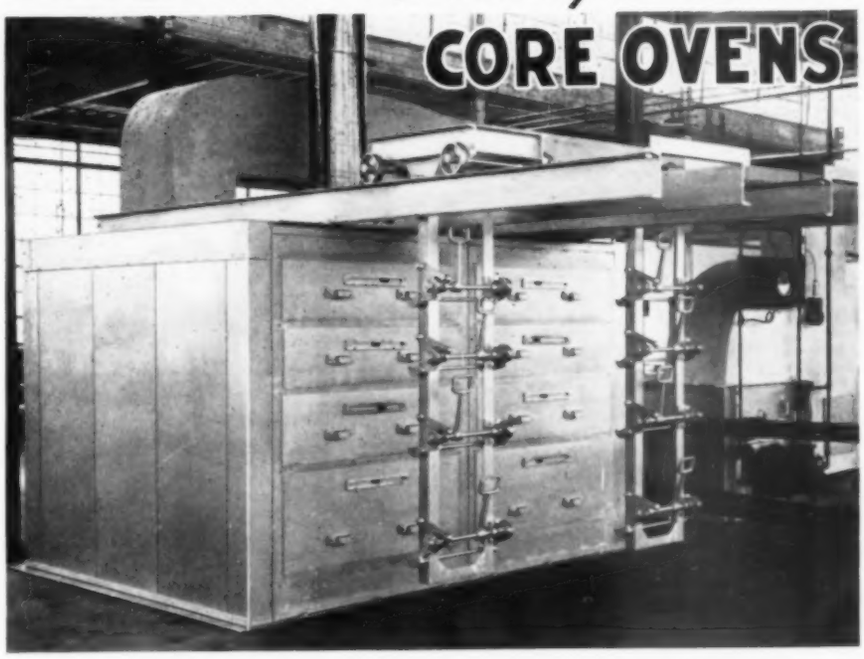
As the metal is charged and during the melting process, flux is dusted on the surface in such quantities as are needed to prevent burning. The amount of flux required during this operation is small but it is essential that the molten metal, as it wells up in the crucible, should be kept dusted with a light layer of flux. If this is not done, considerable burning will take place with resultant loss of metal and fouling of the melt and crucible walls with oxide.

After the metal is melted and at a temperature not exceeding 1300 degrees Fahr., the melt is stirred. This operation is performed with a 1 inch iron rod bent in the form of an ell with the short leg approximately the depth of the crucible. This stirring rod is moved in the crucible in such a manner as to give a rotational motion to the melt. During the stirring operation flux is added in sufficient quantity to form a fairly heavy coating on top of the melt.

The stirring causes the flux to wet the oxide particles in and on the melt, thereby making them heavier and causing them to separate and sink to the bottom of the crucible. After the stirring is completed the thermocouple is inserted and the surface of the melt carefully is covered with flux, particular attention being given to the area where the surface of the melt contacts the crucible wall and around the thermocouple.

It is necessary that the melt be well covered with flux at this stage to prevent burning during the subsequent heating period. The crucible contents are then heated to approximately 1600 to 1650 degrees Fahr. and allowed to cool to the casting temperature, which generally is between 1400 and 1550 degrees Fahr. The superheating operation refines the grain and thereby improves the mechanical properties

COLEMAN *Rolling Drawer* CORE OVENS



One of eight batteries of Coleman Rolling Drawer Core Ovens at New York Air Brake Co., Watertown, N. Y.

•

COLEMAN OVENS

Are also built in the following types:

- PORTABLE
- TRANSRACK
- CAR
- TOWER
- HORIZONTAL CONVEYOR

Heating systems for any fuel most economically available in your locality.

Write for catalogs

Bake Cores Perfectly, at Lowest Cost for Fuel!

Coleman Rolling Drawer Core Ovens are practically continuous bakers of small and medium cores—one or more drawers can be loaded or unloaded while others are being baked . . . Automatic closing plates prevent escape of smoke and gases . . . Patented double-suspension ball-bearing drawer-pullers provide safe, vibrationless handling of the more delicate cores . . . Inside of the oven, drawers run on frictionless self-aligning differential rollers which require no lubrication.

THE FOUNDRY EQUIPMENT CO.
BUILDERS OF COLEMAN AND SWARTWOUT OVENS
CONTRACTING ENGINEERS AND MANUFACTURERS
CLEVELAND, OHIO

COLEMAN
CORE AND MOLD OVENS

of magnesium alloys considerably.

After the crucible is ready for casting the surface of the melt is cleaned by carefully spudding away and removing the scale of flux and oxide from the pouring lips and the surface of the melt. The metal burns readily at this temperature (1400 to 1600 degrees Fahr.) as soon as the protecting flux layer is removed. Burning during the cleaning of the melt and the pouring of the casting is controlled by dusting a 50-50 mixture of finely powdered sulphur and boric acid on the surface of the metal.

It is standard practice in some foundries to add 0.05 per cent metallic calcium to the crucible just before the metal is poured. The calcium helps prevent surface oxidation of the casting in the mold if the agents in the sand do not protect the metal adequately. The calcium also may afford some protection during heat treatment. The amount added is controlled carefully because more than a few hundredths of a per cent slow up the rate of solution heat treatment.

After the casting has been poured the crucible is returned to the melting floor and cleaned preparatory to charging for the next melt. If proper casting practice has been followed, a layer of molten metal about 2 or 3 inches deep has been left in the bottom of the crucible. This residual metal is desirable for two reasons: (1) The danger of pouring flux with the metal is much less if the crucible is not drained, and (2) the presence of molten metal facilitates melting down the next charge.

The side walls of the crucible are spudded down and the dross removed from the surface of the melt and the bottom of the crucible by suitable tools. During this cleaning operation sufficient flux is sprinkled on the metal to prevent burning. The crucible is now ready to charge for the next cycle of operations.

The normal consumption of flux in the crucible melting method is between two and three per cent of the weight of the metal melted. The crucible charge may consist of either 100 per cent virgin ingot, 100 per cent scrap, or a mixture of both. If the melting operation is carried out properly, the properties of the resulting castings will be independent of the nature of the charge. Usual foundry practice is to use about 40 per cent ingot and 60 per cent scrap for each melt. Scrap for use in the crucible should be clean and free from adhering sand and metal screens.

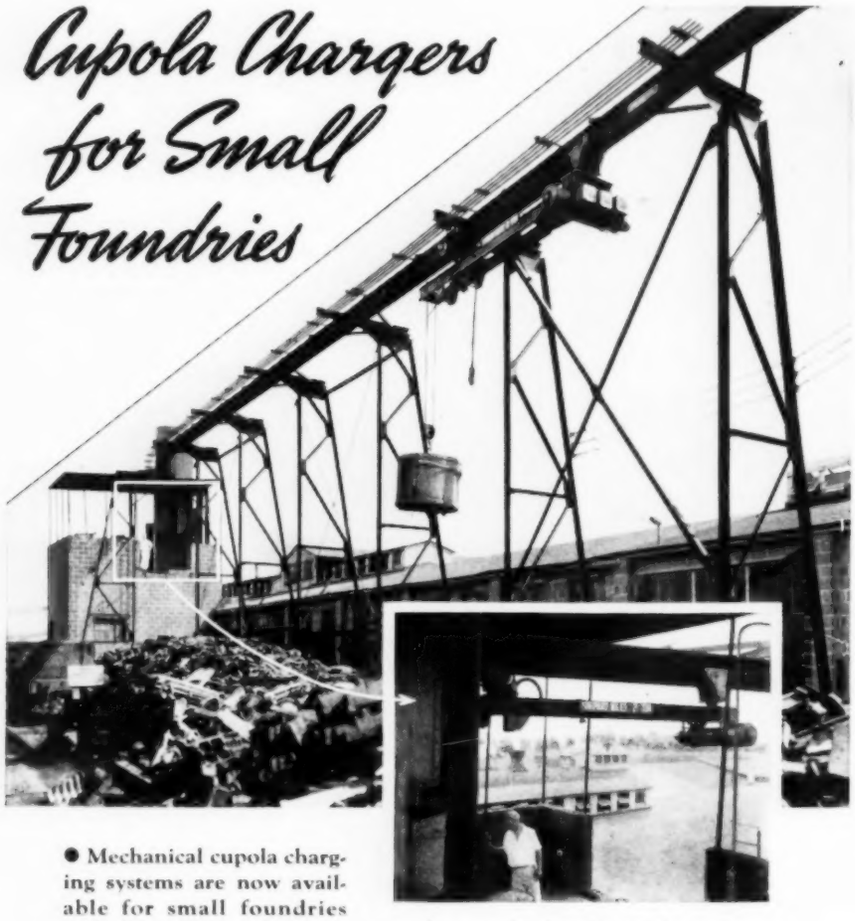
Temperature Control Necessary

Accurate melting and pouring temperature control is necessary. This is secured by the use of either chromel-alumel or iron-constantan thermocouples in mild steel protection tubes immersed in the melt. The crucible is removed from the furnace above the desired pouring temperature and allowed to cool in the pouring shank until ready.

During the past year, the increases in magnesium foundry production have stimulated the development of large melting units of 1000 to 2000 pounds capacity, from which metal is poured into small individual crucibles at about 1300 degrees Fahr. The small crucibles are then placed in their furnaces, fluxed and brought up to temperature as described earlier. Ingots and scrap are melted together, the large size of the batch permitting improved composition control.

Production from the small crucibles also is speeded up as they are charged with metal already melted. These large units are oil or gas-fired and are of both center-tilting and nose-tilting types. The melting pots are of heavy wrought steel construction similar to the small crucibles. Protection from oxidation is secured by the use of flux. Additional developments can be expected as experience is gained in the operation of these units.

Cupola Chargers for Small Foundries



● Mechanical cupola charging systems are now available for small foundries with daily melts of 15 to 30 tons.

No need for an expensive cupola enclosure or charging floor. An inexpensive runway to carry the charger and an operator's platform at the cupola door is all the construction necessary.

Foundrymen who seek better metal at lower costs—no matter what the daily tonnage may be—can obtain complete information by writing to Montour Falls.

A COMPLETE LINE OF CRANES & HOISTS

SHEPARD NILES CRANE & HOIST CORP.

360 SCHUYLER AVENUE . . . MONTOUR FALLS, N. Y.

After cooling for a safe period following the pouring, the castings are shaken out by hand or on vibratory screens. The cores are removed by vibrating and with hand and air tools. After sandblasting, the gates and risers are cut off with metal-cutting band saws having 4 teeth per inch and running at 8000 feet per minute. The sawdust is swept up frequently to minimize the possibility of ignition by occasional sparks from the saw. The gates and risers from very heavy castings may require removal by air chisels. Lathes and other machine tools also are used to remove gates and risers not easily accessible for sawing.

If heat treatment is desired, this usually is done before the final cleaning operations. The castings are brought up to the solution heat treating temperature in not less than two hours, left for the specified total time, removed and cooled in air. The temperatures and total times for the two common magnesium sand casting alloys are as follows:

Dowmetal H—12 hours at 730 degrees Fahr.

Dowmetal C—20 hours at 760 degrees Fahr.

Slightly higher temperatures may be required if calcium has been used in the casting operation.

Increase Physical Properties

The solution heat treatment increases the tensile strength and elongation and is particularly desirable for parts requiring shock resistance such as airplane landing wheels. If increased hardness and high yield strength are required, even at a sacrifice of elongation, these may be secured by an aging treatment of 16 hours at 350 degrees Fahr., following the solution treatment. Aircraft engine parts frequently are used in the heat treated and aged condition.

Circulating air electric or gas-fuel furnaces are used for the heat treatment of magnesium castings. Direct gas-firing is not recommended for temperatures above 740 degrees Fahr. Indirect gas-firing should be as satisfactory as electric heat from the standpoint of atmosphere control but might be less simple mechanically. For temperatures up to 800 degrees Fahr. SO_2 has proved to be a satisfactory inhibitor of surface oxidation at a concentration of approximately 0.5 per cent. From preliminary tests the use of an atmosphere made by the controlled combustion of natural gas followed by dehydration appears to be a possibility.

The cleaning room operations consist of grinding, filing and buffing. The remainder of the gates and risers are ground off smooth with the casting surface and as much

Use **SANDCUTTERS** *for*
CORRECT SAND CONDITIONING
at **LOWER COST $ $ $**

THE condition of sand cut by the Sandcutter method is unexcelled, because it can be prepared in accordance with individual requirements for moisture, bond, and permeability. It riddles fast, rams easily, and vents perfectly.

The action of the cutter in mixing sand and water is most thorough—it is never spotty. Dry spots, wet spots, lumps, and pockets of new sand cannot escape the churning, blending action of the cutting cylinder. The blades cut and recut every particle of sand the full width and depth of the heap, breaking up all lumps and thoroughly distributing bond and moisture. The sand is thoroughly mixed, aerated and cooled as it is thrown backward into the air and tossed from side to side. The tempered sand falls in ridged windrow formation—loose, soft, fluffy and cool.

Throw away your shovel for good—for *your* good. Shoveling in any form is always costly. It is one of the things you eliminate with a Sandcutter—the fast, efficient, low-cost portable sand conditioning system that has been the standard in more than 1200 foundries for 33 years.

Investigate the new models now—there is a size and type for every need. Ask for literature.

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505 S. BYRKIT ST. ★ MISHAWAKA, IND.

of the general cleaning operation is done on grinding wheels as is possible. Surplus metal, fins, etc., which are inaccessible to the grinding wheels are removed with rotary filing tools. These rotary files are mounted on flexible shafts and rotate at speeds up to 3500 revolutions per minute, the smaller diameter tools running at the higher speeds.

In some castings it is required that the entire surface be finished by grinding and polishing. This is usually done on buffing wheels to the surface of which has been glued abrasive powder of different grades. The grinding and polishing is done on machines which are equipped with dust-collecting systems, preferably individual, so arranged that the magnesium dust immediately is wetted with a water spray and is stored under a large excess of water. Final disposal of the sludge should be by burying after dilution with earth or old core sand.

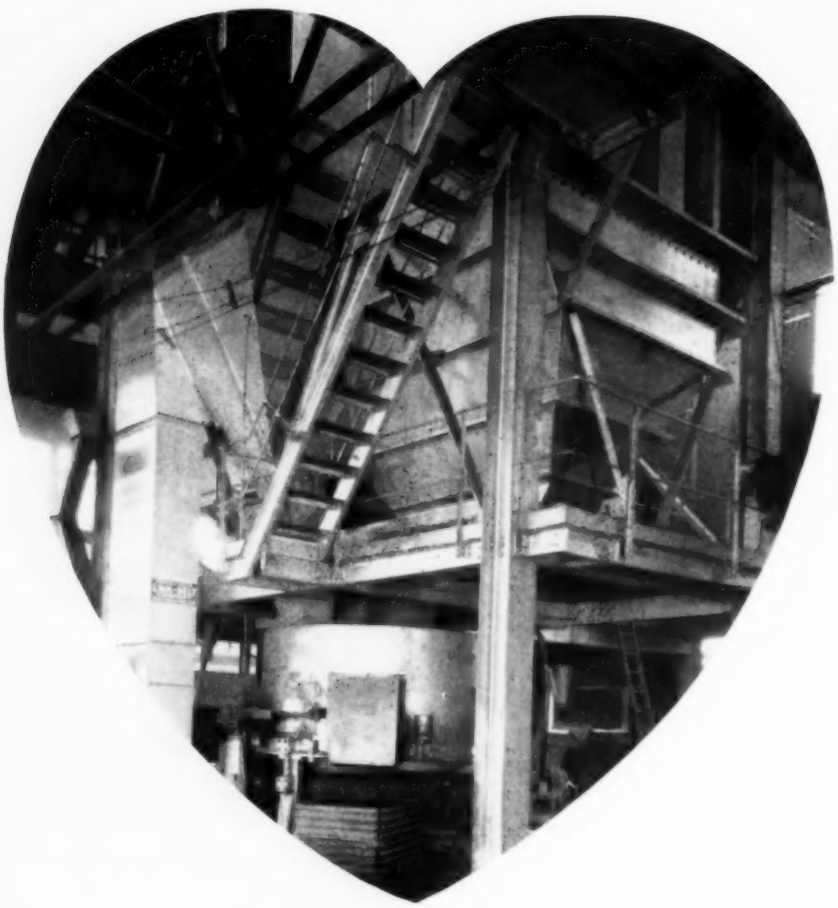
After the castings have been completely cleaned they are resandblasted to give a uniform surface appearance. They are then given a pickle of approximately 1 minute in a two per cent sulphuric aqueous solution, a water rinse and a one-minute immersion in a chrome-pickle bath, followed by rinses in cold and hot water. The chrome-pickle solution contains 1.5 pounds of sodium dichromate and 1.5 pints of concentrated nitric acid per gallon. This treatment affords protection against corrosion during storage and provides a suitable paint base for subsequent painting.

The bulk of the magnesium sand castings produced in this country are made from the two compositions listed in Table I. They appear to be meeting most of the service requirements put upon them in an increasingly wide range of applications. New compositions, however, can be expected to be developed in response to changing needs. As an example of such development, methods have been perfected for the control of iron contamination in the casting alloys listed in Table I to less than 0.005 per cent. If other and more controllable impurities also are held to low values, the salt water resistance of magnesium alloys is remarkably good and applications formerly considered impractical become possibilities.

This is the second and concluding article of two on the production of magnesium alloy castings in sand. The first appeared in the March issue.

THE EDITORS

IF YOUR SAND
MUST BE RIGHT



PUT A CLEARFIELD MIXER
IN THE HEART OF THE SYSTEM

CLEARFIELD
MACHINE COMPANY
CLEARFIELD
PENNSYLVANIA, U. S. A.

Will Have Exhibit

Carborundum Co., Niagara Falls, N. Y., has arranged for an exhibit at the Museum of Science and Industry, Chicago. Feature of the exhibit will be a large mass of iridescent silicon carbide abrasive in crystalline state mounted on a finished wheel of the same material. It also will include an acturama of Dr. Edward G. Acheson's laboratory where he made his discovery of the material during an experiment in 1891, and an industrial motion picture of manufacturing processes and uses of abrasives, a life-size workshop equipped with abrasives for wood and metalworking machines, a model plant for production of silicon carbide, and a battery of low-power microscopes to show structure models of silicon carbide and diamond.

To Hold Convention

The forty-third annual convention of the National Metal Trades Association will be held at the Palmer House, Chicago, May 8 and 9. Subjects to be discussed will treat with problems on industrial relations.

Offices of the Chicago Ordnance District of the War Department have been moved from 433 West Van Buren street, Chicago to the First National Bank building, 38 South Dearborn street. Col. Donald Armstrong is executive officer.

ANNEALING MALLEABLE CASTINGS

(*Continued from page* 39)

The charge of approximately 8000 pounds net is loaded into boxes and loaded on a car. The car is moved in position beneath the opening of the heating and holding furnace. The furnace chamber is hot, because a heated charge just has been transferred to the cooling chamber. The elevating motor button is pressed and the elevators on the ends of the heating furnace as shown in Fig. 4 start raising, contact the car and elevate it to its final sealed position in the furnace. A limit switch breaks the motor circuit at that point and the elevators stop. The elevators are locked into position by locking bars mounted on the furnace structure which hold the car in the sealed position. A car thermocouple connection is made and the power is turned on the heating units.

Records the Temperature

Temperature is controlled by a strip chart control instrument which, for this particular cycle, is set at 1720 degrees Fahr. The instrument also has a recording point which records the temperature in the center of the charge on the car. The temperature of the charge reaches 1720 degrees Fahr. in approximately 7 hours, is held at that temperature for a period of 5 hours, and then is ready to be transferred to the cooling furnace.

The charged car is lowered to the track, moved to a position beneath the cooling furnace, and elevated into sealed position in that furnace. A car thermocouple connection is made and the power is turned on the heating units and cooling system as required by the automatic control.

Temperature of the cooling furnace is controlled by a strip chart control instrument, which is set for the particular cycle at 1400 degrees Fahr. and the charge is cooled and equalized at that temperature. The control instrument applies power to the cooling system blower motor or to the heating units, as needed. A coasting period is provided between the two, so that the heat will come on, should the temperature drop exceed a given amount.

The temperature of the center of the charge is recorded on a round chart instrument, and when this temperature reaches 1400 degrees Fahr., a program cooling control automatically is placed in action, which regulates the cooling of the charge through the critical temperature at a predetermined rate. The predetermined cooling curve is applied to the strip chart instrument, which supplies power to the cooling system or heating units. For the particular cooling cycle and charge used no heat is used. When the center of the charge in the cooling furnace has reached 1300 degrees Fahr., or less, it is ready to be removed.

Each charge requires 12 hours total time in each of the furnace chambers. This gives a total of 24 hours required for one complete cycle. However, since the charges are changed every 12 hours, half the cycle being completed in each furnace, two complete charges are annealed in each 24 hours. That gives a total of 8 tons of net castings per 24-hour day. On the basis of that cycle, the energy consumption is 300 kilowatt-hours per net ton of castings annealed.

The castings when removed from this equipment, although slightly discolored, are free of scale. No gas atmosphere of any type was applied to this equipment, other than the natural atmosphere made by the castings themselves while being heated and cooled in the furnace.

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PLAN CONVENTION ACTIVITIES

(*Continued from page* 45)

time, and while all plants throughout the country will be working at capacity by convention time, foundrymen should gain much valuable information through exchange of experience on various problems connected with defense work.

The island of Manhattan and the territory surrounding it offers much of interest to the convention visitor. The numerous attractions available should provide additional incentive for convention attendance. In that connection it hardly seems necessary to mention the famous skyscrapers including the Chrysler, Empire State, Woolworth and Rockefeller Center buildings, noted department stores such as Wanamaker, Macy, Bonwit-Teller, Saks, etc., the great bridges Brooklyn, Manhattan, Queensboro, Triborough, etc., and famous museums such as Metropolitan Museum of Art, Museum of the City of New York, Museum of Modern Art, and the American Museum of Natural History.

Other attractions include the theater district around Broadway and Forty-second street, Hayden Planetarium, widely known universities such as Columbia, Fordham, New York, and the College of the City of New York, beautiful parks including Central, Bronx Botanical Gardens, Bronx Park zoo, and the famous churches such as Little Church Around the Corner, St. Patrick's Cathedral, Cathedral of St. John the Divine.

Plans for the preconvention tour have been completed and offer an excellent opportunity to visit Old Virginia. The pilgrimage leaves Washington on May 10 at 6:30 p.m. on a cruise down the Potomac arriving at Norfolk, Va. the next morning. Following a bus tour around that city and Newport News, the party goes to Huntington Park, and thence to Williamsburg. A guided tour of Williamsburg restored to its historic, colonial setting, permits visitation of all points of interest. From Williamsburg the tourists go to Jamestown, Yorktown and Old Point Comfort where they arrive at 5:30 p.m. At 6:40 p.m. a steamer is boarded for the return trip to Washington arriving the next morning. In Washington a number of regularly scheduled sightseeing trips are available to see that city, and also to visit Arlington, Alexandria and Mount Vernon.

Technical sessions which will be held during the annual convention have been arranged to cover as wide a field as possible, and include a well balanced program for the malleable, nonferrous, steel and gray iron branches of the industry, as well as papers of general interest to all. The big day of the convention will be Wednesday, May 14, with the business meeting and awards presentations occupying the whole morning. The announcement of the medal awards and the recipients is presented on page 58 of this issue. The technical program is arranged so that nonferrous and malleable sessions are predominant in the first two days, with steel and gray iron sessions covering the last two days. Sessions of interest for all are scattered throughout the entire four days. The sand shop course and the gray iron shop course sessions run through the week. All sessions will be held in the rooms of the Hotel Pennsylvania, convention headquarters. The tentative program of technical sessions follows:

Monday, May 12

9:00 a. m.—Registration.

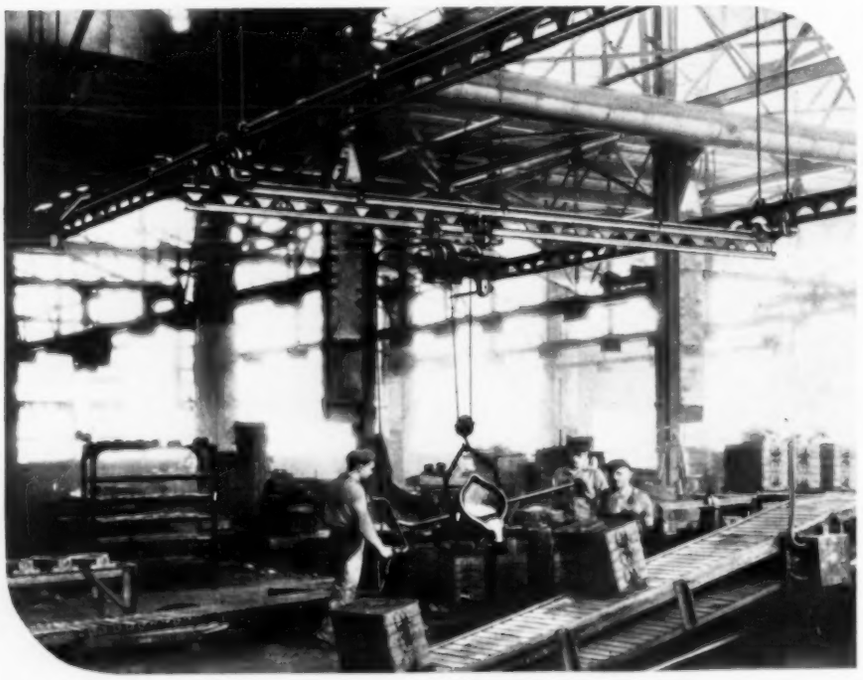
10:00 a. m.—Sand Control Shop Course (Session No. 1).

Nonferrous Foundry Sand Control.

10:00 a.m.—Foundry Refractories.

Some Observations on Malleable Furnace Refractories, by J. A. Kayser, Laclede-Christy Clay Products Co., St. Louis.

Firestone as a Cupola Refractory, by F. J. Wurscher, Acme Steel & Malleable Works, Buffalo, N. Y.



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Electric Furnace Refractories, by Representative of Harbison-Walker Refractories Co., Pittsburgh.

11:30 a. m.—Gray Iron Foundry Shop Practice Course (Session No. 1)
Discussion leader—Donald J. Reese, International Nickel Co. Inc., New York.
Subject—Cupola Practice and Equipment.

2:00 p. m.—Malleable Founding
Graphitization of Cementite in Cupola White Iron, by N. A. Ziegler, Crane Co., Chicago.
The Velocity of Conversion of Austenite to Ferrite and Cementite, by H. A. Schwartz, National Malleable & Steel Castings Co., Cleveland.
Flame Hardening of Malleable Iron, by Stephen Smith, Air Reduction Sales Co., New York.

2:00 p. m.—Nonferrous Founding
Gating and Risering Non-Ferrous Castings, by R. R. Clarke, General Electric Co., Erie, Pa.
Non-Ferrous Foundry Practice, by G. K. Eggleston, Barnes Mfg. Co., Mansfield, O.
Effects of Furnace Atmospheres in Non-Ferrous Melting, by J. M. Kelly, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

2:00 p. m.—Foundry Safety and Hygiene.
Speakers: D. E. Cummings, director, division of industrial hygiene, department of medicine, University of Colorado, Denver. Roger Williams, assistant director, inspection & safety service department, The State Insurance Fund of New York; James R. Allan, assistant manager, industrial engineering & construction department, International Harvester Co., Chicago.

3:00 p. m.—Chapter Delegate Conference.
Presiding—H. S. Simpson, vice president, A.F.A., and president, National Engineering Co., Chicago.

4:00 p. m.—Foundry Costs.
Foundry Budgeting, by E. C. Bumke, Oliver Farm Equipment Co., South Bend, Ind.
Cost Committee Report on Classification of Cost Divisions.

4:30 p. m.—Lecture Course (Session No. 1).
Core Practices and Theories.
Lecturer—H. W. Dietert, Harry W. Dietert Co., Detroit, Mich.

7:00 p. m.—Chapter Officers' Dinner.

7:00 p. m.—Engineering Instructors' Dinner.
Presiding—F. G. Seiling, International Nickel Co., New York.
A University Course in Foundry Control Methods, by Fulton Holtby and H. F. Scobie, University of Minnesota, Minneapolis.
The Foundry Industry and the Engineering Graduate, by R. F. Harrington, Hunt-Spiller Mfg. Co., Boston.

Tuesday, May 13

9:30 a.m.—Annual Sand Shop Control Course (Session No. 2).
Discussion Leader—D. F. Sawtelle, Malleable Iron Fittings Co., Branford, Conn.
Subject—Malleable Foundry Sand Control.

10:30 a. m.—Nonferrous founding.
Welding Aluminum Castings, by F. T. McGuire, University of Notre Dame, Notre Dame, Ind.
Magnesium Foundry Alloy Practice, by M. E. Brooks and A. W. Winston, Dow Chemical Co., Midland, Mich.
Silicon-Iron Bronzes, Their Foundry Qualities and Physical Constants, by E. G. Jennings and Harold J. Roast, Canadian Bronze Co., Montreal, Que.
Aluminum - Copper - Magnesium - Zinc Casting Alloys, by L. W. Eastwood and L. W. Kempf, Aluminum Co. of America, Cleveland.

10:30 a.m.—Malleable Founding.
Malleable Iron in the Defense Program, by J. H. Lansing, Malleable Founders' Society, Cleveland.
Observations on the Duplexing of Malleable Iron, by G. A. Schumacher, Albion Malleable Iron Co., Albion, Mich.

10:30 a. m.—Gray Iron Founding.
Gating and Risering for High Pressure Work, by H. H. Judson, Goulds Pumps, Inc., Seneca Falls, N. Y.
Effects of Moisture and Preheating on Cupola Blast, by J. T. Eash and R. E. Smith, International Nickel Co., Bayonne, N. J.
Melting in the Cupola—A Summary of Certain Papers on Combustion Theories, by S. C. Massari and R. W. Lindsay, Association of Manufacturers of Chilled Car Wheels, Chicago.
Certain Aspects of Hydrogen in Cast Iron, by C. A. Zapffe, Battelle Memorial Institute, Columbus, O.

10:30 a. m.—Apprentice Training.
Apprentice Training in the Defense Program, by W. F. Patterson, chief of apprenticeship, Division of Labor Standards, Washington.
Related Instruction for the Foundry and Pattern Shop Apprentice—A Symposium: (a) What May be Taught the Foundry Apprentice as Related Foundry Instruction, by A. L. Armantrout, Carnegie-Illinois Steel Corp., Chicago; (b) What May be Taught the Foundry Apprentice as Related Pattern Instruction, by K. F. Ode, The Falk Corp., Milwaukee; (c) What May be Taught the Pattern Apprentice as Related Pattern Instruction, by Frank C. Cech, Cleveland Trade School, Cleveland; (d) What May be Taught the Pattern Apprentice as Related Foundry Instruction (Speaker to be assigned).
Jobs in the Foundry, by A.F.A. Committee, Chairman A. H. Wornom, Newport News Shipbuilding & Dry Dock Co., Newport News, Va.

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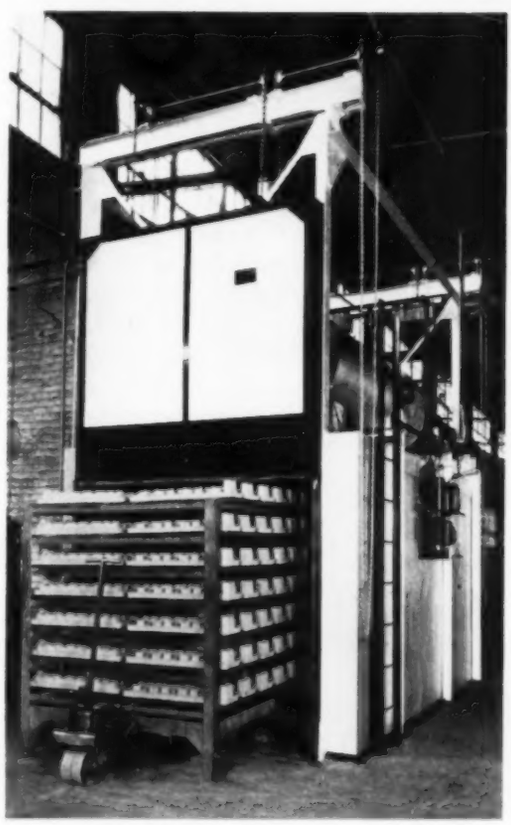

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WRITE FOR NEW BULLETIN NO. 141

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12:30 p. m.—Malleable Division Round Table Luncheon Discussion.
Discussion Leader—J. H. Lansing, Malleable Founders' Society, Cleveland.

12:30 p. m.—Nonferrous Division Round Table Luncheon.
Cause of Porosity and Leakage in Non-Ferrous Castings, by A. H. Hesse, Naval Research Laboratory, Anacostia Station, Washington.

2:00 p. m.—Job Evaluation and Time Study.
Job Evaluation and Merit Rating, by A. L. Kress, National Metal Trades Association, Chicago.
Time and Motion Study, by Phil Carroll, New York.

2:00 p. m.—Sand Research—Steel Foundry Sands.
Progress Report on Investigation of High Temperature Effect on Steel Sands, by J. R. Young, Cornell University, Ithaca, N. Y.
Some Properties of Foundry Sands at High Temperatures, by G. W. Ehrhardt, Cornell University, Ithaca, N. Y.
Report of Committee on Foundry Sand Research.
Synthetically Bonded Steel Molding Sands, by R. E. Morey and H. F. Taylor, Navy Research Laboratory, Anacostia Station, Washington.

3:30 p. m.—Annual Gray Iron Foundry Shop Course (Session No. 2).
Discussion Leader—E. J. Carmody, Chas. C. Kawin Co., Chicago.
Subject—Gating and Risering.

4:30 p. m.—Annual Lecture Course (Session No. 2).
Core Practices and Theories.
Lecturer—H. W. Dietert, Harry W. Dietert Co., Detroit.

7:00 p. m.—Apprentice Supervisors' Dinner.
Presiding—James G. Goldie, Cleveland Trade School, Cleveland.

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Wednesday, May 14

9:30 a. m.—Annual Sand Control Shop Course (Session No. 3).
Discussion Leader—C. W. Thompson, New Jersey Silica Sand Co., Millville, N. J.
Subject—Gray Iron Shop Control.

10:30 a. m.—Annual Business Meeting and Awards Presentation.
Presiding—President L. N. Shannon, Stockham Pipe Fittings Co., Birmingham, Ala.
Reports of Officers.
President's Annual Address, by L. N. Shannon.
Presentation of Awards.
Awards Address, by S. Wells Utley, Detroit Steel Castings Co., Detroit.

1:00 p. m.—Steel Division Luncheon.
Presiding—R. S. Munson, Atlantic Steel Castings Co., Chester, Pa.

2:00 p. m.—Sand Research.
Dry Sand Molding Procedure for Heavy Castings, by W. A. Hambley and A. Lebesh, Allis-Chalmers Mfg. Co., Milwaukee.
Testing Foundry Sands and Its Coordination with Molding Procedure, by J. J. Boland, Griffin Wheel Co., Chicago.
Clay Slurry Additions for Molding Sand Rebonding, by R. H. Mooney, Saginaw Malleable Iron Division, General Motors Corp., Saginaw, Mich.
Reproducibility of Tests of Foundry Sands, by Stanton Walker, National Industrial Sand Association, Washington.

2:00 p. m.—Patternmaking.
Co-operation Between the Pattern Shop, the Engineer and the Foundry, by E. J. Brady, Western Foundry Co., Chicago.

2:00 p. m.—Foreman Training.

2:30 p. m.—Steel Founding.
Converter Developments, by A. W. Gregg, Whiting Corp., Harvey, Ill.
Use of Models in Improving Steel Casting Practice, by S. W. Brinson, Norfolk Navy Yard, Portsmouth, Va.
Report of Committee on Heat Treatment of Steel Castings.

3:30 p. m.—Annual Gray Iron Foundry Shop Course (Session No. 3).
Discussion Leader—A. E. Rhoads, Detroit Electric Furnace division, Kuhlman Electric Co., Bay City, Mich.
Subject—Electric Furnace Melting in the Gray Iron Foundry.

4:30 p.m.—Annual Lecture Course (Session No. 3).
Core Practices and Theories.
Lecturer—H. W. Dietert, Harry W. Dietert Co., Detroit.

6:30 p. m.—Annual A.F.A. Dinner.

Thursday, May 15

9:30 a. m.—Annual Sand Control Shop Course (Session No. 4).
Discussion Leader—W. G. Reichert, American Brake Shoe & Foundry Co., Mahwah, N. J.
Subject—Steel Sand Shop Practice.

9:30 a. m.—Annual Gray Iron Foundry Shop Course (Session No. 4).
Subject—Causes of Casting Defects and Remedies.
Discussion to be led by members of Gray Iron Division Committee on Analysis of Casting Defects.

10:30 a. m.—Gray Iron.
Effects of Pouring Temperatures on Mechanical Properties of Cast Iron, by V. A. Crosby, Climax Molybdenum Co., Detroit.
Some Factors Influencing Graphitizing Behavior of Cast Iron, by S. C. Massari, Association of Manufacturers of Chilled Car Wheels, Chicago.
Inoculated and Uninoculated Gray Cast Iron, by J. T. Eash, International Nickel Co., Bayonne, N. J.
Notes on the Undercooling of Gray Cast Iron, by Alfred Boyles, Battelle Memorial Institute, Columbus, O.

10:30 a. m.—Plant and Plant Equipment.
Reclaiming Sand by Wet Method, by

Howard Mason, Symington-Gould Corp., Depew, N. Y.

Centrifugal Casting and Equipment, by N. Janco, Centrifugal Casting Machine Co., Tulsa, Okla.

Cupola Dry Blast Equipment and Process, by F. M. Johnson, Surface Combustion Corp., Toledo, O.

10:30 a. m.—Steel Founding.

Mechanism of Pin-Hole Formation, by C. E. Sims and C. A. Zapffe, Battelle Memorial Institute, Columbus, O.

Report of Committee on Radiography, by C. W. Briggs, Steel Founders' Society, Cleveland.

2:00 p. m.—Gray Cast Iron.

Nickel-Molybdenum Irons, by R. D. Flinn, American Brake Shoe & Foundry Co., Mahwah, N. J., and D. J. Reese, International Nickel Co., New York City.

Heat Treatment of Cast Iron, by C. A. Nagler and R. L. Dowdell, University of Minnesota, Minneapolis.

2:00 p. m.—Steel Founding.

The Fluidity of Carbon and Alloy Cast Steels, by H. F. Taylor and E. A. Rominski, Naval Research Laboratory, Anacostia Station, Washington, and C. W. Briggs, Steel Founders' Society, Cleveland, O.

Report of Committee on Methods of Producing Steel for Castings.

Steels for High Temperature Service, by W. C. Stewart, U. S. Naval Experiment Station, Annapolis, Md.

4:00 p. m.—Annual Lecture Course (Session No. 4).

Core Practices and Theories.

Lecturer—H. W. Dietert, Harry W. Dietert Co., Detroit.

Obtains New Plant

To provide for increasing volume, SPO Inc., Cleveland, manufacturer of molding machines, vibrators and production patterns, has purchased a modern brick, fireproof building at 7500 Grand avenue in that city, which adds approximately 20,000 square feet of floor space to its facilities. Offices and manufacturing are combined under the same roof, and ample shipping facilities are available. The site occupies about 5 acres.

Publishes Handbook

Industrial Truck Statistical association, 208 South La Salle street, Chicago, has compiled a material handling handbook covering certain principles for material handling evolved through experience of the past 20 or 25 years. The handbook is intended as a practical guide for the analysis of materials handling problems and operations and their correlation with production, store keeping and related functions and for the planning and operation of industrial truck material handling systems.

The book, available without cost to production executives and engineers, is divided into four parts: The place of material handling in industrial management; material handling management; organizing an industrial truck handling system; practical truck engineering. The book also contains tables of traction units, mechanical electrical equivelants, energy calculation and cost estimating data, a bibliography listing reference sources on related subjects and an appendix giving formulas for determining whether upper floors of buildings will support an industrial truck, also specifications for dust vapor and explosion proofing.

Porcelain Enamel institute has opened an office in the Chandler building on I street, Washington, in charge of Thomas B. Collins.

Changes Are Made

Federal Specifications board, Washington, has published an amendment to specification QQ-I-652 for gray iron castings as follows: Page 5, paragraph H-2. Delete paragraph in its entirety and substitute: H-2. Navy.—Navy department purchases will be made under the issue in effect on date of invitation for bids of the following Navy department specifications: 46-I-5 Iron, gray, high-test, castings; 46-I-6 Iron, gray, castings. Page 8, Table—Column "Test bar B", dimension "b", delete 1 5/16 and substitute 15/16.

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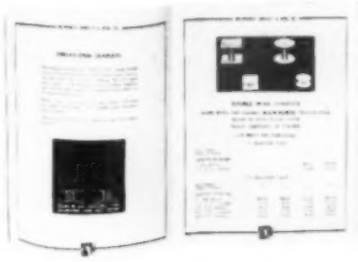

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AROUSE INTEREST IN SAFETY

(*Continued from page* 46)

and probably are, trained and expert in safety and who must support all others in the organization in attacking this never-ending job. Even so, the chief must be the key and make it known that he is the real key, or best results usually are lacking.

That is the answer to the way and means to approach and maintain safety consciousness.

To get a broader opinion, six different plants were asked this same question. Their answers were: Employment manager, safety director, chairman of safety committee, plant manager, personnel supervisor. All indicated that the real direction originated from the head of the plant or company, which bears out my opinion that the real key man of safety is sitting at the top.

It is only right that this should be so, and here is where a place for the word interest applies fully. Management interests are two: First, moral interest; second, financial interest, one important as the other.

Management has a definite moral interest. When men are hired and taken into the foundry, management has a definite responsibility to send them home to their wives and families at the end of the day's work in as good physical condition and health as when the men reported for work in the morning. Neglect of machine guarding, or condition of equipment, or poor housekeeping eventually spells accidents. Accidents do not just happen, but are the result of neglect or carelessness. This must be prevented by instructions to newly hired men, and repeated continually by the supervisors and foremen, who necessarily must reflect the moral responsibility of the top.

Financial interest is in the hidden costs due to loss of time and production, as well as other items, which are four times the direct costs which appear on the books of the industry. Every accident costs money, whether it also causes injury or not.

Cost of Maintenance

Management has a large investment in trained men and cannot afford to overlook these losses, all of which may be prevented.

2. *What does it cost not to maintain safety consciousness?*

Not to maintain safety consciousness is difficult to represent in monetary values, but the absence of it in any organization very quickly will cause absence of workmen on account of injuries, resulting in interruption of production and operating schedules.

Cost may be represented further by the cost of breaking in other workmen, plus accident compensation and medical expense. High frequency of accidents in any shop will cause workmen to become nervous, irritated and dissatisfied and will contribute to labor difficulties.

3. *How can foremen be kept on their toes?*

Foremen may be kept on their toes through frequent distribution of safety literature and accident statistics, as well as assigning time in all meetings of foremen and supervisors to safety subjects. In addition, in case of a reportable accident of even a trivial nature, the assistant foreman or straw-boss on the job should be required to make a written report, stating his recommendations for the prevention of future accidents of that nature.

This form or report should be submitted to the department head or superintendent, and transmitted to the works manager's office, and in turn given to the personnel department to assist in completing the formal report, which will be filed eventually under the name of the employee with his other records. This may appear to involve some

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detail, but such a system has proved very effective in reducing frequency of accidents through making foremen more safety conscious, and alert to hazards and unsafe practices.

In case of serious accident a special committee should be appointed by the management to investigate. Upon receipt of their report the hazards should be corrected and a meeting called of all supervisors and the matter thoroughly discussed and analyzed for the benefit of other departments to prevent a recurrence of similar accidents.

4. *How can the men in the shop be kept enthusiastic?*

Records should be kept of all injuries and recorded on the employe's personnel record. Some workers prove more careless than others. By careful analysis these careless workers may be discovered very quickly. As workmen welcome a safe place to work in, they are enthusiastic about even the slightest effort on the part of the management to better working conditions, and to show them how to do their jobs more safely.

Keep Mind Refreshed

To maintain this enthusiasm, try to show, in the case of a lost-time injury, the financial loss suffered by the injured person as well as the physical suffering he sustains. By keeping their minds refreshed as to the possible financial loss in the case of an accident, as well as following through on suggestions and safety recommendations, thereby proving the management's sincerity about the subject, the workman retains his enthusiasm in regard to safety work.

General rules with regard to safety should be established for the individual plants. These rules should be of a general character and one should not try to cover everything in the category of safety. A card or pamphlet listing from 24 to 36 general rules should be more than sufficient, but they should be agreed upon before being printed and once they are issued, the rules should stand until conditions make it necessary to change them.

With this set of general rules it is easier for the management to apply discipline more fairly, because when a man violates a rule he expects such discipline.

5. *What can your insurance company do for you in this respect?*

The foundry industry has learned to use the knowledge of technical men in its organization and relies upon their advice. As we have developed men of this type, so have our insurance companies, who employ technical men trained in accident prevention methods.

It is extremely useful for many plants to utilize the technical accident prevention service of their compensation insurance carriers in examination of boilers, machinery and elevators upon which accidents are serious. Use of the technical inspection service of insurance companies is almost universal. Suggestions are made on the safeguarding of machinery, on setting up safe operating practices, the analysis of plant accident reports, and help in working out safety programs, attending safety meetings and giving general advice and suggestions to the safety supervisory forces.

Technical knowledge in accident investigation and analysis which the insurance safety engineer can provide is good schooling for foremen.

6. *What are some devices used for maintaining safety consciousness?*

(a) Exhibits of safety equipment, goggles, safety shoes which have saved accidents, photographs of particular accidents, as a chipper whose goggle lens shattered without eye injury.

(b) Insurance and National Safety Council poster changed frequently.

(c) Boards showing number of

Schramm Direct Drive Compressor installed "under the stairs" for supplying compressed air service in a well-known plant.

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In making this installation of a Schramm compressor advantage has been taken of space in the plant which would hardly have been suitable for large equipment. Yet it is conveniently placed for easy inspection when required.

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days without lost time accidents at convenient locations such as main gate.

(d) In one plant green lights are shown on a board to designate no accident, and turned to red to notify all in the plant that an accident has taken place, with designation of the department suffering the accident. This helps create safety consciousness.

(e) Showing of safety films.

(f) Use of men other than foremen on safety committees, changed and rotated to give large numbers the experience. This helps to educate the workmen in safety methods and the reasons for them, and develops a lasting safety consciousness.

(g) Contests with prizes for individuals and departments. However, all such devices are only of temporary value. Contests are extremely difficult to devise that will be entirely fair, due to the wide variation of hazards in the several departments of the shops. Unless the factors can be equalized so that departments with few hazards can compare with those with more hazards, and at the same time take into account the varying number of men, little safety consciousness can be maintained and it may seem better to apply the effort to better effect.

7. *What are some of the causes of lack of safety consciousness?*

(a) Management not following through with a program once started. When employees see any let up on the part of management and supervisors they are quick to let up themselves.

(b) Lack of safety consciousness in departments or sections of plants is caused by unfairness of so-called safety contests due to not taking into account difference in hazards, number in department, etc. Unless all factors can be equalized the safety records should not be used as comparison between departments.

(c) The old human failing in thinking that something may occur to injure someone but will not happen to himself.

(d) Poor housekeeping is a large contributor to lack of safety consciousness, as is poor maintenance of equipment.

Time Devoted To Safety

Each department would like to go on indefinitely without accident and if this idea can be put across it will help dispel the lack of safety consciousness.

8. *Does the small plant devote enough time to Safety?*

Some plants expend a great deal of time and effort without the desired results, while others, with apparently little effort, achieve a good record.

However, whether the time be little or much, if accidents are occurring, or there remain accident probabilities, the time should be found somehow to give the matter proper attention.

9. *How much can the small plant afford to spend on Safety?*

Assuming that a steel foundry can afford to spend whatever may be its own normal rate in the state in which it is located, within a few years, by applying a simple common sense safety program, the foundry or plant can operate its entire safety program and bear its compensation and medical costs for the original rate. If such a plant is rated above the normal rate, which would indicate the poor experience of that plant, then it can well afford to spend more to bring that experience down to better than normal. Actually it is not necessary, nor is it recommended, to spend great amounts of money for a safety program. Of course, some money ought to be spent to guard dangerous operations, but with care there is no need of spending large amounts for this purpose.

One company claims that compensation costs in 1938 averaged $19.77 per man, and in 1939 averaged $23.33 per man. These amounts, are indicative of a basic guide for further expenditures. If by additional

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moneys spent, compensation expense can be reduced (and it can) the plant is a large gainer in intangible costs, plus the greater satisfaction of employees.

The amount of money spent by a small plant necessarily must be determined by the individual plant after analyzing its own conditions thoroughly.

10. *What is the value of personal contact in keeping safety consciousness alive?*

In analyzing the accidents in a number of plants it was found that 8 per cent of the accidents were attributable to housekeeping, 10 per cent to mechanical causes, and by far the greatest percentage to handling materials. This percentage actually totalled 43 per cent of the total accidents. This large percentage of accidents from handling materials indicates the importance of management's part in reducing accidents. It is self-evident that this only can be done by personal contact if frequency and severity rates are to be reduced.

Appoints Committee To Study Wages

A committee to investigate and recommend a minimum wage in the gray iron jobbing foundry industry has been appointed according to General Philip B. Fleming, Administrator of the Wage and Hour division, United States Department of Labor. The first meeting of the committee is scheduled to be held at the Department of Labor Building, Room 3229 in Washington, March 31, at 2 p.m. The members of the committee are:

For the public: Sidney E. Sweet, dean, Episcopal Church, St. Louis, chairman; W. H. McPherson, professor of economics, Oberlin College, Oberlin, O.; John B. Andrews, executive secretary, American Association of Labor Legislation, New York; Malcolm Sharp, professor of law, University of Chicago, Chicago, and Hardy C. Dillard, assistant dean, School of Law, University of Virginia, Charlottesville, also director, Institute of Public Affairs.

For the employers: R. E. Kucher, vice president, Olympic Foundry Company, Seattle, Wash.; M. A. Fisher, treasurer, Standard Buffalo Foundry Co. Inc., Buffalo; Charles J. Miller, president, Fremont Foundry Co., Fremont, O.; Franklin Farrell 3rd, Farrell Birmingham Co. Inc., Ansonia, Conn., and George M. Morrow, Goslin Birmingham Foundry Co., Birmingham, Ala.

For the employes: Harry Stevenson, president, International Molders and Foundry Workers Union, of North America, Cincinnati, O.; Chester A. Sample, vice president, International Molders and Foundry Workers Union of North America, Chicago; Dennis Keefe, vice president, International Molders and Foundry Workers Union of North America, Norwalk, Conn.; Shelly Walden, vice president, International Molders and Foundry Workers Union of North America, Chattanooga, Tenn., and Harold J. Ruttenberg, research director, Steel Workers Organizing Committee, Pittsburgh.

The gray iron jobbing foundry industry is defined by the Wage & Hour division as the "manufacture of ferrous or ferrous base castings, rough and finished, except malleable iron castings, steel castings, pipe and pipe fittings, for sale by the producer but not the manufacture of the same for use by the producer in the fabrication of other products or parts thereof."

The foundries which are operated by manufacturers solely for the purpose of making castings which are used by the same concern in the production of other products, are eliminated by the division from the definition of the gray iron jobbing foundry industry. The distinction is drawn between such concerns which are termed "captive foundries" and those which make castings for sale.

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Defense Training Program

(*Continued from page* 107)

4. Name at least three methods for cleaning castings.
5. What happens if a grinding wheel is running too fast?
6. Why should the dust collecting system always be operated when grinding castings?
7. What would happen if a grinding wheel was run too slow?
8. What materials are used in a tumbling barrel when cleaning castings?

Unit No. 6 is devoted to a study of melting practice for both ferrous and nonferrous metals and alloys, and the following outline indicates the job notation, the practical work involved, and the technical information required. For ferrous work the cupola is the unit while for nonferrous melting, the crucible is employed.

1—Cleaning out drop. Separating metal from coke. Weighing and taking to charging floor. Importance of knowledge of what was in the drop. Reasons for weighing.

2—Chipping melting zone. Chipping out cupola. Preparation of lining to receive daubing. What takes place in this part of the cupola. Importance of clean walls.

3—Mixing daubing mixture. Wetting down clay and sand. Cutting over to proper consistency. Requirements of a good daubing mixture.

4—Patching and daubing melting zone and spout. Method of applying mixture to lining. Finishing to size. Preparing breast, tap hole and spout. Function of melting zone. Importance of proper shape and size. Function of breast, tap hole and spout.

5—Preparing sand for bottom. Tempering sand. Getting it to charging floor. Requirements of this sand. Thickness of bottom, hardness, and slope.

6—Weighing metal and coke charges. Weighing pig, scrap and coke. Type of metal. Melting ratio. Necessity for accuracy.

7—Charging cupola. Starting fire. Setting bed charge. Charging pig, scrap limestone, coke. Figuring bed charge, depth of charges, fluxing, and regulation of charges.

8—Lining ladles. Mixing ladle daubing, lining hand ladles, and lining bull ladles. Types of ladles and pouring carried on in foundries.

9—Melting aluminum. Weighing metal, furnace tending, and pouring. Care of crucibles and melting pots. Temperatures for pouring.

10—Melting yellow brass. Furnace tending, pouring, and mixing alloys. Care in melting, melting points, and pouring temperatures.

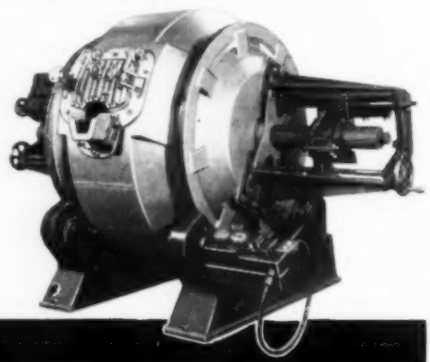
Aim of the following examination is to give the student an opportunity of showing what he has learned from the study of cupola practice. It is not expected that he will be able to answer every question. He is directed to read the directions for each part carefully and be sure that he understands what he is going to do before he begins. Letters T and F follow each question. The student is asked to draw a circle around either one to indicate whether the statement is true or false.

1. The sand bottom of the cupola should be rammed very hard. T. F.
2. When the cupola is fully charged, it is good practice to allow it to stand a short time before putting on the blast. T. F.
3. The height of the tuyeres from the bottom depends on the quantity of metal to be held in the cupola. T. F.
4. Heat resistance is the first requirement of a cupola lining. T. F.
5. There is no advantage in a double lining. T. F.
6. The cupola is the only furnace used to melt iron in the foundries. T. F.
7. Sand for forming the bottom should be wet and have high bond. T. F.
8. The sand bottom should slope down from center to sides. T. F.
9. The portion of the cupola from 20 inches above the tuyeres to the charging door is known as the melting zone. T. F.
10. The thickness of the sand bottom is located first at the center. T. F.
11. The advantage of a double lining is that it protects the shell. T. F.
12. The last charge of fuel put into the cupola is known as the bed charge. T. F.
13. The region of highest temperature cannot be known after the bottom is dropped. T. F.
14. Large pieces of metal always should be charged on the first charge. T. F.
15. The melting zone is directly above the tuyeres. T. F.
16. The breast is that part of the cupola lining connecting the spout with the bottom. T. F.
17. The charges of iron must be ten times as heavy as the coke charges. T. F.
18. The amount of fuel on the bed depends on the amount of metal to be melted. T. F.
19. The intermediate charges of coke should be about 20 inches thick. T. F.
20. Large pieces of metal should be charged about the middle of the heat. T. F.

Questions in the following part can be

Some foundrymen like Detroit Rocking Electric Furnaces for their fast melting speed. Some like them especially for their increased yield of good castings and improvement in the average quality of the product. Some consider a Detroit Furnace's operating flexibility its most potent advantage. As a matter of fact these are only three of the many advantages you get in a Detroit Automatic Rocking Electric Furnace. Metal losses are lower. Machine shop scrap is less. Savings can be made in moulding equipment and floor space. Cheaper raw materials can frequently be used to advantage. Labor costs less.

But don't take our word for these claims — find out for yourself. Let us arrange for you to see a few of these furnaces in operation and talk to their owners yourself. Get the lowdown first hand from those who know. Write for further facts today.



DETROIT ELECTRIC FURNACE DIVISION
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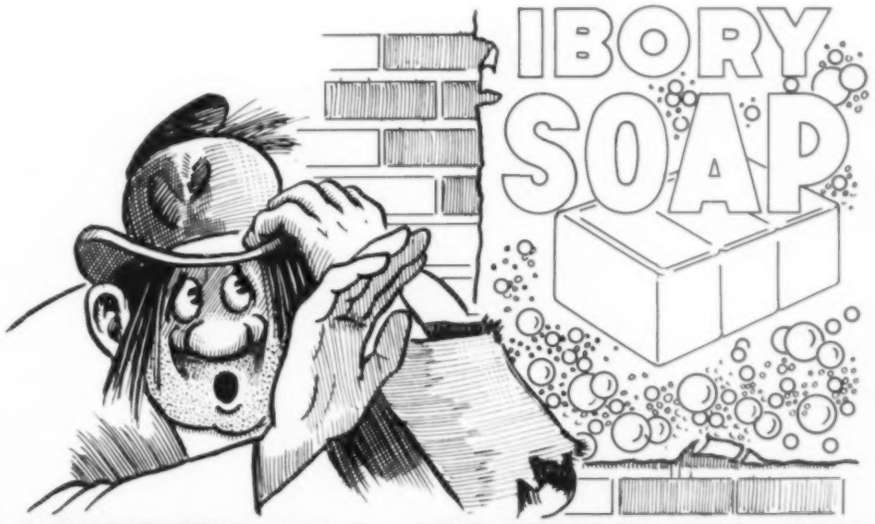
answered by a single word, or words, which are missing from the statement. If you cannot think of the exact word called for, but are reasonably certain that some other word is equally correct, then write it down. Your score for this part will be based on the number of blank spaces correctly filled.

21. The shell is bolted to a plate known as the ..... plate.
22. The two kinds of lining used for the cupola are ..... and .....
23. The course of brick should be laid so that all ..... are broken.
24. The first charge of fuel put into the cupola is known as the .....
25. The kindling should be arranged so that it will .....
26. The thickness of the sand bottom is located first at the .....
27. In making the sand bottom the sides should slope down toward the .....
28. The tuyeres are the openings in the cupola through which the air is forced from the ..... into the fuel bed.
29. The doors are held up by .....
30. If the metal freezes in the tap-hole it will cause trouble when .....
31. Principal flux used in the cupola is .....
32. Daubing mixture should be left to soak ..... hours before using.
33. Section of the lining built up to the tuyeres is known as the .....
34. Portion of the cupola above the charging door is known as the ..... zone.
35. The sand for the bottom is put in through the .....
36. When lighting the cupola, care should be taken to have it ..... on all .....
37. Irregular charging will cause a .....
38. The charges should be ..... in the cupola.
39. Time required to get the fire in good condition for charging the iron depends on the size of the ..... and the amount of .....

In a final test the following list of questions may be arranged for either a written or oral examination:

1. What rule is followed in deciding what part of the pattern will come in the cope or drag?
2. When is it a good plan to make an oil sand match?
3. For what purpose are risers used?
4. Name the parts of the mold that carry the metal to the cavity.
5. When sand is rammed with the fingers it is called?
6. If facing sand was not used on a heavy casting what would be the result?
7. What are the cross pieces called on a floor flask?
8. What are gaggers and for what are they used?
9. Name the types of flasks used in molding.
10. In setting the pattern on the mold board what are the important things to be considered?
11. Name a few different types of patterns used in a foundry.
12. Where is the parting of a mold?
13. Why should this part of the mold never be slicked down?
14. What size should a runner and gate be in relation to the size of the sprue?
15. Why is it a good plan to rap gated patterns and uneven patterns through the cope?
16. What are some causes of blow holes in a casting?
17. What is meant by venting a mold, and why are molds vented? How far should the vent wire go down?
18. What safety precautions should be practiced while pouring metal into a mold?
19. How are cores located in the mold?
20. How are cores secured in a mold?
21. How does molding sand differ from core sand?
22. What kind of oil is the base for almost all liquid core binders?
23. What is the foundry term for a material added to core sand to give it bond?
24. If the cupola sand bottom is too steep what will be the result?
25. Why is the melting zone the hottest part of the cupola?
26. Why do the bricks in the cupola lining overhang the tuyeres?
27. What is the difference between the tap spout and the slag spout. Where are they located on a cupola?
28. Where is it located and what is the function of the wind box on the cupola?
29. What determines the height of the tuyeres from the sand bottom of the cupola?
30. In charging scrap steel and pig iron in what order should they be charged? Why?
31. What is the name of the first charge of coke in the cupola?
32. What is meant by the sand bottom in a cupola, how is it put in?
33. What care is necessary in selecting and ramming the sand?
34. What are the most important things to check in charging a cupola?
35. What will happen if the tap hole is too long?
36. In most cases what is the best temperature at which to pour nonferrous castings?
37. What is brass? What is it made from?
38. How does the size of the gates for brass compare with the gates for iron?
39. What metals are used most frequently to make nonferrous castings?
40. In making alloys for nonferrous



INTERNAL SHRINKING

is caused by unequal cooling between light sections and heavy sections.

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placed in heavy sections equalize the cooling rate. They become an integral part of the casting. Chill Coils are easy to use and are more economical. Chill Coils are furnished Polished, Aluminum Coated, Electro-Copper Coated or Electro-Tinned, in all sizes.

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metal, in what order are the metals melted or alloyed?

41. What is the cause of excessive fins on a casting?
42. What are some of the causes of a shift in a casting?
43. Why is it good practice to stop pouring just before the metal is fully up in the riser?
44. Why is it a good practice to keep the pouring basin filled with metal?

This is the second and concluding part of a 300-hour foundry training program set up by James G. Goldie, foundry instructor, Cleveland Trade School as part of the National Defense training program under the auspices of the Cleveland Board of Education. The first part appeared in the March issue of THE FOUNDRY. THE EDITORS

Finkelstein Foundry & Supply Co., 9901 South Alameda street, Los Angeles, is building an addition to a storage building 22 x 285 feet.

Foundrymen Attend Toledo Meeting

Ninety foundrymen attended a meeting at Toledo on Feb. 17 at the Hillcrest Hotel. The gathering was the first of its kind in that city and was sponsored by the A.F.A. in cooperation with a local committee headed by D. E. Hensley, Southern Wheel division, American Brake Shoe & Foundry Co. Others on the committee were: R. L. Binney, Binney Castings Co.; Roy Clark, Toledo Machine Tool division, E. W. Bliss Co.; L. M. Long, Bunting Brass & Bronze Co., and E. C. Mathis, Pickands, Mather & Co. Foundrymen from Adrian, Monroe and Coldwater, Mich., and Fostoria, Conneaut, Fremont and Defiance, O., were present. Official representatives of the Northeastern Ohio and Detroit Chapters also attended. Chairman Hensley in opening the meeting presented Robert E. Kennedy, secretary of the A.F.A. who spoke briefly on association activities. He then introduced Ray Fleig, president and Frank Steinebach, past president of the Northeastern Ohio Chapter; V. C. Bruce, a director of the Michiana Chapter; Ed Burke of the Detroit Chapter, all of whom expressed greetings to the Toledo meeting.

Principal speaker of the meeting was William G. Reichert, American Brake Shoe & Foundry Co., Mahwah, N. J., who spoke on "Sand Testing and Control." Mr. Reichert discussed first sand testing as a desirable feature in the foundry, stating that it could be used as a guide, for judging new sands, and for specification work. He showed the possibility of getting uniform sand into the foundry through control methods. He listed three fundamentals in sand testing work: Using it as a standard for determining proper addition; using it to test sand to determine whether or not it could be kept within definite property limits; and using the tests for assuring proper additions to keep the sand within the proper limits. The speaker listed as general properties to be considered in early control work: Grain structure, permeability, tensile strength, moisture, and transfer strength.

Next Mr. Reichert discussed the method of installing sand control in the shop. Following this he reviewed some experimental work on factors affecting the surface finish of castings, showing pictures of results obtained by varying first moisture, grain size, and then sea coal, all other factors remaining the same under any one test.

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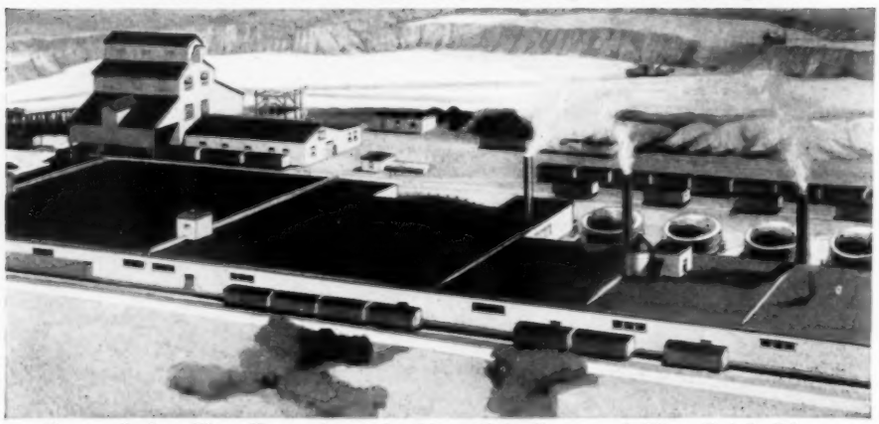

Goose Lake Clay Deposit with Clay Grinding and Fire Brick Plant

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Holds Sand Clinic

A sand clinic was held at St. Louis Feb. 21, under the sponsorship of the F. E. Schundler & Co., Joliet, Ill. Approximately 20 operating men from foundries in the St. Louis area were in attendance. Charles B. Schureman, technical advisor of F. E. Schundler & Co., led a discussion on synthetic sands and the use of bentonite in the preparation of such sands. A similar clinic was held last year.

Eastern Clay Products Co., Eifort, O., has established a research project at Battelle Memorial Institute, Columbus, O., to work primarily on the improvement of clays and the development of new clays.

Abstracts

FROM WORLD FOUNDRY LITERATURE

Anodic Oxidation

Anodic Oxidation of Aluminium, a Survey of the British Patents, by A Special Correspondent, *The Metal Industry*, London, England, Nov. 29 and Dec. 6, 1940.

The author of this article points out that while in recent years a large volume of literature on anodic oxidation has appeared, there has been little or no attempt to deal with the patent situation in the technical press. He believes that an article covering that phase will be of value especially since the re-armament program calls for greatly increased production of anodized metal, and proceeds to remedy the situation by outlining the main claims of various British patents.

Interesting comment on the scope of patents examined is—"In the first place the main tendency is to elaborate the two basic electrolytes, namely, sulphuric acid and oxalic acid, in spite of the obvious difficulty of controlling and maintaining the compositions of such complex electrolytes, quite apart from any consideration of the effectiveness of, or the need for, such modifications and additions. Very little attempt has been made to elaborate the chromic acid electrolyte, and still less to develop the use of totally different electrolytes such as fused salts or nonaqueous solutions. The latter fact may probably be taken as an indication of their technical and /or commercial impracticability."

High-Frequency Furnace

Application of the High-frequency Furnace in the Iron Foundry (Die Anwendung des Hochfrequenzofens in der Eisengiesserei) by C. W. Pfannenschmidt, *Die Giesserei*, Duesseldorf, Germany, Sept. 6, 1940.

A study is made of the relative advantages of the high-frequency and the arc furnace in the foundry. Based on labor, material and electric current costs in Germany, the conclusion is drawn that in spite of the appreciably higher amortization rate, the high-frequency furnace is capable of competing successfully with the arc furnace, under the described conditions. Among the advantages cited which favor its use in the gray iron foundry, are: Elimination of the cost of the electrodes, low material and labor charges for renewal of the crucible lining, simple and inexpensive control and favorable current consumption figures. Both types of furnaces are described and commented on. Twenty-one references to related subjects are included.

Mold Design

Die Mould Design, Its Application in the Gravity Diecasting Process, by George W. Lowe, *The Metal Industry*, London, England, Nov. 22, 1940.

In this article which primarily is concerned with running and venting molds, the author states that the position of the runners must be considered first. That is fixed by the principle of placing the thinnest sections farthest away from the gate to insure more even chilling. Form of runners usually is a matter for the individual foundry, and the author illustrates three general types for use with thin plate work, heavy castings, and those with irregular outline and limited running area.

All runners should be of the minimum size in the initial design so that they may be increased should running be inadequate.

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STOVE FOUNDRIES

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Daily production of the average stove foundry seldom exceeds 700 pounds of metal per man compared with 1750 pounds of metal per man in a modern mechanized foundry. This comparison is based on the daily melt and the number of molders and helpers employed. The saving in floor space is also impressive. Based on the daily melt in a manually operated plant, only 1.9 pounds of metal per square foot of gross floor area occupied are poured into castings in comparison with 4½ to 6 pounds in a mechanically equipped foundry.

It is not unusual to find in continuous foundries on stove plate work that a crew of 9 men on three floors will make 85 molds per hour, size 30" x 24" x 10", and 6 men will produce 48 hand rammed molds per hour, size 22" x 24" x 8" flasks. For snap flask work, size 12" x 18", the hourly output per man ranges from 40 to 60 molds. Foundry losses run less than 4½%.

Machines are loyal partners, always ready to perform, make no demands and ask no questions. Power-driven machinery will step up production, slash the pay roll and relieve the management of many annoying details.

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A. A. Wickland & Co.

—Advt.

GATING IS IMPORTANT

(*Continued from page* 41)

believe there might be a surprise in store for some foundrymen if they would make a definite series of experiments on gates on some of the castings that are now giving them periodic trouble.

In the case of those castings now made with almost no trouble it is to be presumed that the gating is correct. However, in those castings that are produced with unexplainable but definitely recurring periodic trouble, we believe a great deal of valuable information will be found by study of various factors. Those will include the position of the gates with respect to the sprue and risers, and to the thick and thin sections in the castings. Also a study of gate size and direction will determine what happens when the metal first enters the mold and during the balance of the pouring period. Furthermore it will show what happens during the solidification of the casting as the metal progressively cools from the point farthest from the riser to the gate connecting the riser with the casting.

Record the Changes

Break some of the castings through different points so that the structure of the metal within the casting may be studied. Study the direction that the crystals take, and the position of the imperfections that are giving trouble. Make a detailed record of the investigation including data on the shape, size and position of the gates. Each time a change is made, make a record of such change and the condition of the casting derived from the new gating.

Fracture a number of castings in each heat poured from a given gating. Fracture each casting in several directions, through the different sections. Study the crystal growth in sections near the gate, farthest from the gate, near the riser, farthest from the riser, at the thick section, at the junction between thick and thin section, and at the junction of the gate with the casting. If the gate happens to be near a thin section and consequently may affect the structure due to slow cooling, fracture at that point. Determine whether proper fillets are located where gates and risers join the casting.

After studying all of those, a digest of the records will yield some surprising and interesting facts that will be helpful in producing a maximum yield of good castings per heat at a minimum cost. It should also be borne in mind that the study must be based upon a given gating for a certain alloy. If another composition is to be used, obviously the gating may have to be changed. Consequently, to compare the gating of a given casting poured in two different alloys in an attempt to decide what gating is to be standardized, is impossible. Each type of alloy cast necessarily requires a definite type of gating for a given casting if the best results are to be secured.

Manganese bronze, aluminum bronze, or silicon bronze are classed as high shrinkage alloys but each has its particular characteristics, and consequently, a definite gating method may not be universally satisfactory for all three in the production of some particular casting. There probably are castings which can be made in the three alloys by the use of identical gating, but it is not to be expected such gating would be necessarily the most economical gating for all three alloys.

Factors Influence Gating

The other compositions cast in the nonferrous foundry, phosphor-bronze, red brasses and the like are equally dissimilar in their cooling characteristics, in their demands for feeding, and in other conditions which influence the choice of gating. Consequently, the best foundry practice demands the choice of a particular gate for each alloy for a given casting.

We have just touched on the question of the cost of castings being influenced by the type of gating but it is a phase of the gating problem that must not be overlooked. In the first place some of the compositions cast in the nonferrous foundry are such that it is a very laborious process to remove the gates. Those compositions such as some of the aluminum bronzes, resist sawing and are expensive to remove. Therefore, a minimum amount of gates to be removed is advisable if the cleaning room cost is to be kept at a low figure. However, it should be stated emphatically that the cleaning room cost should not prevent the use of adequate risers or the proper gates to insure sound, high quality castings.

Cost of cleaning must be a secondary consideration but if intelligently considered the gating can be arranged to make cleaning costs less than if the problem had not had due consideration. Furthermore, the problem of removal of gates and risers is receiving intensive study today by manufacturers of foundry equipment. It is entirely possible that means, such as new machines, will be developed as the demand increases for the rapid removal of difficult risers or gates from castings in alloys that are hard to saw or grind.

Another factor that should be

borne in mind in considering the choice of the right gate is that of maintaining the pattern shape and dimensions. Castings in the rough frequently are expected to be dropped into jigs for subsequent machining and if the shape or size has been deformed by the gates they may not fit. Consequently, an additional operation must be applied before they can be useful. That operation becomes an additional expense which should have been anticipated and prevented in considering the proper gating.

Where castings are to be used for ornamental purposes gates obviously will mar or deface them if they are improperly located on the ornamental part of the castings. Therefore, the use of the casting must be known to the foundryman at the time of his considering the problem of where and how to gate. Good foundry practice can be maintained best where the fullest co-operation exists between designer, consumer and foundryman, so that all the points necessary for the planning of successful gating of the casting are available before any decisions are made on that point.

In closing it will be of interest to show a few examples of different types of gates and risers on the same castings. Figs. 22 and 24 depict two methods of gating rotary pump runners. In Fig. 22 the metal enters the edge of the runner through two gates while in Fig. 24 a horn gate feeds metal into the center. Figs. 23 and 25 indicate procedures employed for gating bells. As may be observed in one case the metal enters through a spray gate at the bottom while in the other the metal enters at the top.

Figs. 26, 27 and 28 show gating methods which are used for valve disks which of course, must be sound to resist pressure. In Fig. 26 additional feeding is gained by raising the end of the mold containing the riser after pouring in the horizontal position. Fig. 27 shows the application of a horn gate feeding into the riser while Fig. 28 indicates a method used in multiple molding.

This is the sixth of a series of articles on gating nonferrous castings. The first five articles appeared in November and December, 1940 and January, February and March, 1941. The seventh will be presented in an early issue.

THE EDITORS

Pipe and Piping for High Temperature

American Society for Testing Materials, 260 South Broad street, Philadelphia, recently has made available a 153-page bulletin entitled, "A.S.T.M. Specifications for Pipe and Piping Materials for High Temperature and High Pressure Services." It contains 24 specifications of which four cover carbon and alloy steel castings. The book is priced at $1.25.

Displays Material

To acquaint its customers with the various grades of iron and steel scrap utilized in steel plants and foundries, Erman-Howell & Co., well known Chicago scrap concern, has assembled representative and generous specimens in a large glass showcase in its offices at 332 South Michigan avenue. Each grade is properly identified and bears a key number through which chemical compositions and physical specifications can be ascertained by reference to a convenient catalog. The display, attractively prepared and illuminated, has attracted much attention since it was installed recently.

The Patterson Foundry & Machine Co., East Liverpool, O., is moving its New York offices from 117 Liberty street to the RKO Building, Rockefeller Center, Fifth avenue. The company manufactures mixing machinery and grinding mills for the chemical industry.

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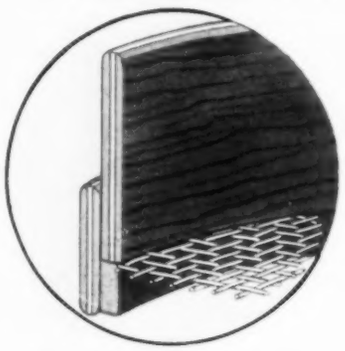

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(*Continued from page* 37)

approached very closely in alloy No. 19ST4 made by the Aluminum Co. of America. The alloy and the heat treating process are patented. In melting this metal for castings at least 50 per cent and usually a higher percentage is ingot metal. The remainder is return metal. Majority of the castings are poured at a temperature of 1250 degrees Fahr. The pouring temperature is very important since it governs the grain size. Fine grain is highly essential to obtain high strength castings. Subsequent heat treatment has no effect on grain size. Treatment is only one of solution followed by a water quench in a 24-hour cycle. Normally these heat treated castings show a yield point between 22,000 and 25,000 pounds per square inch, tensile 38,000 to 45,000 pounds per square inch and elongation of 8 to 12 per cent, deflection 0.01-inch after room temperature ageing of 24 hours.

Should Be Prepared

In a timely and highly interesting article presented in the March and April issues of THE FOUNDRY, Brig. Gen. N. F. Ramsey, commanding general at the arsenal, pointed out that it is essential we should have on hand a sufficient supply of ordnance material to satisfy requirements of field forces until industrial production is able to meet the needs. Substitutes may be necessary to meet urgent and immediate requirements. Quite possibly weldments and forgings, satisfactory enough under leisurely peace time conditions, may have to be replaced by castings. Because of high speeds and terrific strains imposed by modern warfare, the specifications for war material will be considerably higher than for the usual peace time foundry products.

For example consider fighting tanks where carefully fabricated heat treated armor plate protects the crew and vital machinery. At present this armor plate is produced by ten firms in the United States. The French developed a cast steel hull for tanks and it would appear that the turret readily might be produced as a steel casting. Present specifications for armor plate castings leave the chemical composition, heat treatment and manufacturing methods to the foundryman, but with his bid he is expected to submit information on his proposed procedure with each of these items.

The castings must conform to dimensions with a maximum positive tolerance of 1/16-inch for thickness less than ½-inch, and 3/32-inch for thickness from ½ to 1 inch. Castings of course must be free from any defect that might affect strength, ballistic value or appearance. A bonus is paid for each lot of castings resisting complete penetration at impact velocities greater than minimum requirements. This bonus is 5 per cent of the contract price for each 150 feet per second in excess of the minimum striking velocities specified.

Although the method has received comparatively little publicity, a number of plants have solved the former impossible problem of casting steel centrifugally. It is within the bounds of probability that eventually the process will be perfected to a point where it can be used for the production of all gun barrels. Up to the present the ordnance department has developed the centrifugal process for the production of gun barrels up to the 3-inch antiaircraft gun. Experimental castings for the 155 millimeter (6.10 inch) howitzers have been produced and studies are under way to produce guns up to 8-inch caliber. In many respects the cast barrels are better adapted than forgings to the purpose for which they are intended.

During the World war castings were used in gun carriage construction top and bottom, brackets, field gun carriages, breech block carriers. In railway artillery castings were used for recoil mechanisms, base rings, racer, car frames, etc. A wide variety of castings was used in track laying, tractors and tanks. Cast bronze was used extensively in fuse bodies, bearings, liners, slides, gears, etc.

Cast iron products are used in automotive engines and in some other parts of tanks and combat vehicles. Cast iron hand grenades were produced in great quantities in 1917 and 1918.

Owing to the basic character of the product, the foundry still plays an important part in every type of engineering construction, either in the product itself, or in the construction of the tools by which the construction is possible. Cast iron is essential in the manufacture of machine tools, jigs, fixtures and in the heavier elements of weapons where weight and resistance to shock are not so important. Today steel castings are used extensively in sea coast gun carriages and ordnance where weight is not as great a consideration as it is in field artillery, antitank and antiaircraft artillery.

In the antiaircraft carriage approximately 10 per cent of the material is steel casting. The cradle

is a casting containing trunnion blocks and the apron welded to a piece of tubing to form the gun seat. A cast steel pad is welded to the bottom to form a seat for the recoil cylinders. Ball and socket joint for the pedestal is a steel casting. A number of the smaller parts, bushings, gears, hand wheels and worms are bronze castings.

Cast iron shells were used in great numbers during the World war. It is quite probable they will be used again. Cast iron has certain characteristics which make it more desirable than steel for certain types of shells. Cast steel slugs are used in the manufacture of 8-inch and larger sized shells. Some work has been done on centrifugally cast steel shells, but further development is necessary.

Steel and malleable iron castings are supplied to the arsenal by outside manufacturers. Activities of the arsenal foundry are directed to the production of gray iron, brass, bronze and aluminum castings. Many castings in these metals also are procured from the outside.

Arsenal Is Valuable Property

Rock Island is an exceedingly valuable piece of the United States. With land, buildings, supplies of raw materials, mechanical equipment, products in various stages of construction and products ready for shipment the value of the arsenal is estimated at $400,000,000.

Recruiting a labor force, stepping up the personnel from about 2000 to the present 7500 and an anticipated list of probably twice that number, has presented somewhat of a problem. The problem of course is nationwide particularly in the foundry industry where it is not possible to shift labor from other fields. There are no similar industries and no common pool from which labor can be drawn. It takes from 3 to 5 years to train skilled molders.

In the experience of the Rock Island Arsenal the installation and operation of an adequate apprentice training plan has been neither difficult nor expensive. It has paid dividends. As a result of a competitive examination given 600 boys a few years ago, 35 were selected for apprentice training. Space, equipment and a competent instructor were provided. The local school authorities furnish an instructor for class room instruction in shop mathematics, drawing, etc. The apprentices take a nationally known correspondence school course which the boys pay for at a reduced rate. All these young men have completed the four year course and are taking their places in the shop. Foremen are agreed that these apprentices are better than the average mechanic available at present.

The apprentice ranks are recruited from year to year from a list constantly growing larger. More recently a voluntary class of young engineering students has been organized to study problems in the chemical and metallurgical field. Members of the laboratory staff act as instructors and lecturers. The work is affiliated with the course of instruction in a local college. Examinations and grading are in accordance with the standards set up by that institution.

As might be expected where all incoming material and equipment in process of construction at all stages are held to the closest specifications, the chemical and physical laboratories housed in an extensive 2-story building are equipped with all the usual types of testing equipment. Several machines were designed by the laboratory staff and built in the arsenal shops for carrying on special tests on certain pieces of material, tests for which no commercial machines are available.

This is the first of two articles dealing with the foundry and related activities of the Rock Island arsenal, Rock Island, Ill. The second will appear in an early issue.

Glyco Products Co. Inc., has moved its offices, plant and laboratories from 148 Lafayette street, New York, to larger quarters at 230 King street, Brooklyn, N. Y.

Will Hold Western Metal Congress

American Society for Metals will hold its fourth Western metal congress and metal exposition in Los Angeles during May 19 to 23. Technical sessions will be held in the Biltmore hotel and Pan-Pacific auditorium, and the exposition also will be displayed in the latter. One feature of the meeting will be "Foundry Day" to be held May 23, and which was arranged in co-operation with the Northern and Southern California Chapters of the A.F.A.

Members of the Foundry Day program committee include: Robert Gregg, of the Reliance Regulator Corp., Alhambra, Calif.; James E. Eppley, Kinney Iron Works, Los Angeles; B. G. Emmett, Los Angeles Steel Casting Co., Los Angeles; Walter F. Haggman, Foundry Specialties Co., Huntington Park, Calif.; and William Bailey Jr.

Speakers who will present papers at the sessions include Dr. C. H. Lorig, Battelle Memorial Institute, Columbus, O.; E. K. Smith, Electro Metallurgical Corp., Detroit, and V. A. Crosby, Climax Molybdenum Co., Detroit. Mr. Smith will speak on heat and wear resistant cast iron. Mr. Crosby will discuss plain and alloyed cast iron.

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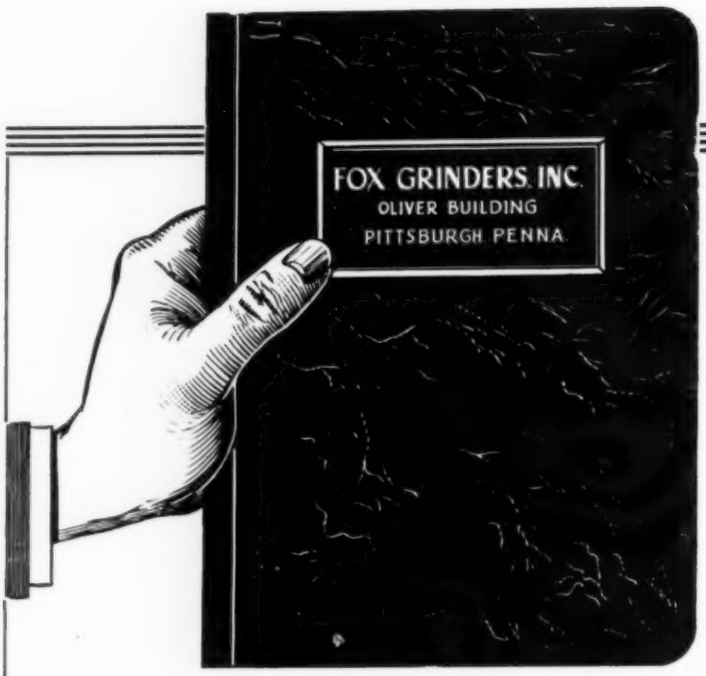

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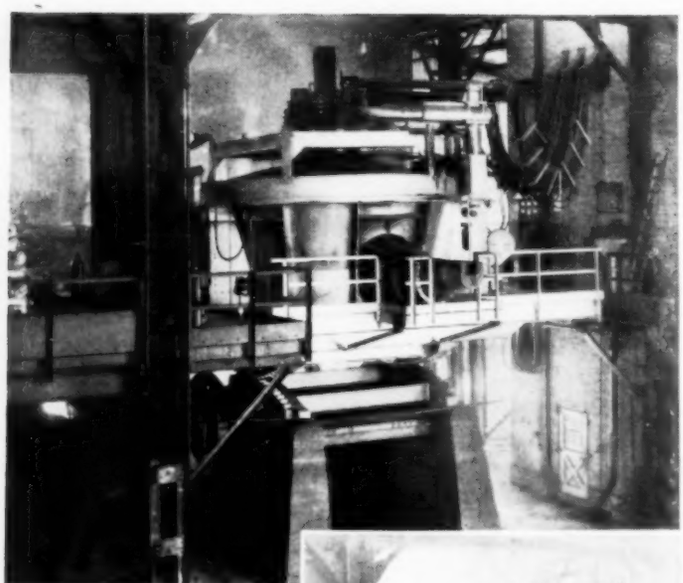

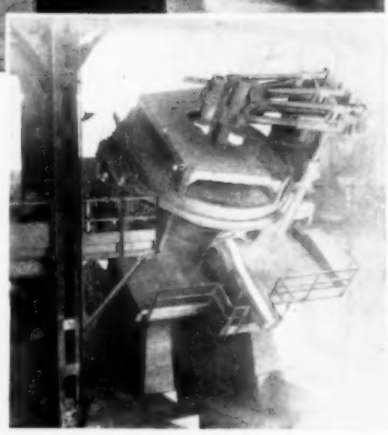

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